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TELEPHONY

THE JOURNAL OF THE TELEPHONE INDUSTRY

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TELEPHONY
The Journal of the Telephone Industry

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FLASHES AND PLUGS

SEVENTH INNING STRETCH. Icer Romeo is a man who is seized with sudden urges to hear how the Yankees are doing.

And so on the night of July 24, from his favorite drug store in Birmingham, Ala., he telephoned radio station WINS, which was broadcasting the game between the Yankees and the St. Louis Browns. "I can't tune in your station," he cried. "Hold the telephone in front of the radio. I want to hear the game—I got a stack of quarters in my hand."

An intrigued sound engineer taped the ear piece of an ordinary head set to the telephone transmitter.

Mr. Romeo was delighted—$16 worth. He heard three innings, the fifth, six and seventh, and then the line was disconnected.

The operator said Mr. Romeo either had run out of quarters or had collapsed with joy.

• • •

ONE MORE NUISANCE MASTERED. Arthur Boetcher maneuvered his way over to an army nurse at Battle Creek's (Mich.) Percy Jones General Hospital.

He shifted his weight shyly from one brand new leg to the other.

"Could you help me remember the sequence of letters and numbers on a telephone dial," he finally murmured.

He turned his face in the general direction of Lieut. Doris Schwartz. "You know," he went on, "you never notice these things when you can see, but after you're blind you feel like such an awful fool not remembering whether the 'I' is in the same hole as the 'ABC' or in the one before it."

The army nurse reviewed it for him, taking a quick look herself to be sure. Over and over her pupil counted out the spaces for each letter and figure, until at last he had it.

"One more nuisance mastered," he said triumphantly.

• • •

WHAT A LINE! Three New York City girls are pretty expert when it comes to feeding a line to men at sea. The are Julia Lo Iacono, Dorothy Sheridan and Luella Ilchert, marine radio telephone operators of the American Telephone & Telegraph Co.

In an average 24-hour period, they handle between 350 and 400 radio-telephone calls to and from all types of vessels (some 1,400 in all) whose home port is New York and equipped with the service, effective within a radius of about 150 miles.

Twice daily the operators broadcast weather reports, made available by a direct hookup to Coast Guard and U. S. Navy Hydrographic Office, to yachts, tugs, fishermen, coastal vessels and others having the coastal and harbor telephone service in the vicinity of New York.

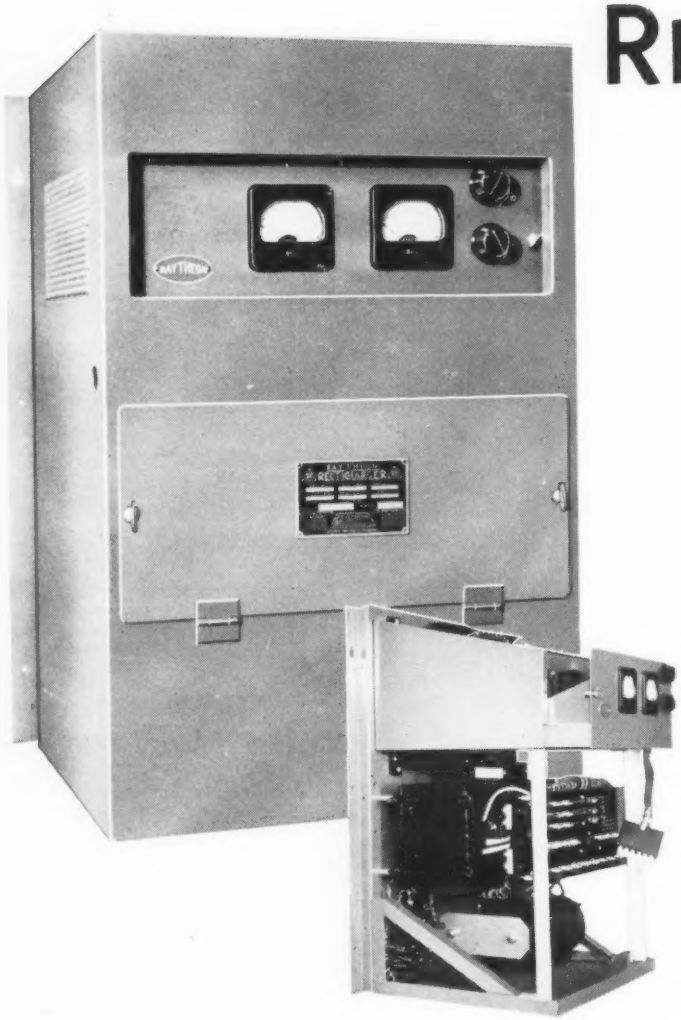
• • •

GLOCCA MORRA. "How Are Things in Glocca Morra?" goes the popular song. But if you want to find out how things really are there, it looks as if you won't be doing it by telephone, judging by the recent experience of a Columbus, Ohio, editor.

Growing restive under constant repetition of the piece over his radio, he decided to clear up the matter "once and for all" with an overseas call to the mayor of the Irish town. But after five hours of combined efforts by the telephone company in Ohio, overseas operators in New York and girls at the London switchboard, everything else in Ireland turned up except the desired party. Donny Cove and Killy Begs were ready with telephones, and presumably mayors, as were Kilderry and a number of other towns. But no Glocca Morra! Libraries in Columbus were consulted, and they too couldn't raise any information on the matter.

As things now stand, Prime Minister Eamon de Valera is in receipt of an urgent cablegram from the editor wanting to know: "Where is Glocca Morra?"

Announcing — A NEW HIGH-POWERED *Electronic* RECTICHARGER



Every part of the new electronic RectiCharger is readily accessible. Note view with cover removed and drawer pulled out for inspection.

FOR EXCHANGES REQUIRING GREATER CAPACITY than has heretofore been available in the well-known Raytheon RectiCharger line, this new electronic model is now available in capacities up to 24 amp. at 24 volts, or 12 amp. at 48 volts.

Use of an electronic amplifier in conjunction with a saturable core reactor keeps the new unit small and compact. Greater flexibility of adjustment is provided, along with greater frequency range, a variety of input and output voltage combinations, and closer tolerance of regulation. By means of a new feature for limiting output current, the unit is self-protecting.

As in the case of standard RectiChargers, the new high capacity electronic model is equipped with long-life dry plate rectifiers, sturdy magnetic components, a well-ventilated, attractive case... and has no moving parts to wear or get out of adjustment.

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IN THE NATION'S CAPITAL

BY
FRANCIS X. WELCH
WASHINGTON
EDITOR

Bell System's record 354 million security issue has Wall Street experts scratching their heads. . . . Ponder why AT&T selected this time to float debentures. Truman's announcement of a treasury surplus next year weakens opposition to repeal of excise taxes.

THE second guessers of Wall Street are still scratching their heads over the recent announcement of the Bell System's whopping big security issue proposal. As announced by the board of directors on Aug. 20, a special meeting of the stockholders of AT&T has been called for Oct. 15 to authorize the biggest issue in the entire history of corporate financing ($354,000,000). The new issue would not go on the market, even if authorized, until next December.

It is a well-known fact, as stated in the AT&T announcement, that the Bell System is in need of considerable "new money" to take care of vast plant expansion and improvement. What puzzles the rail birds at the money market is just why AT&T picked this time to let the other shoe fall.

Last December AT&T floated $343,870,700 worth of convertible debentures in a very good market. Since then, the market has turned rather sour. In fact, during recent weeks it has become downright "sticky" for new financing —not just in the utility field, but for all new financing.

On Sept. 1, redemption of 3 per cent debentures forces their conversion into 387,000 additional shares, thereby increasing the market supply of AT&T stock, even before the new issue finally is authorized for the market.

Does this mean that the AT&T financial wizards, who are supposed to be just about the keenest in the business, as far as guessing long-range market trends, feel that the long-range market prospects are not going to be any brighter than they are right now? Of course, this is just one of those two-sided arguments in which one could make out just as good a case for the proposition that the AT&T figures there is better financial weather ahead —and that it is time to start tying up the package for the market, which should be just about ripe for absorbing this avalanche of securities long towards the end of the year.

Figuring it either way, it is clear that AT&T must need the money to get on with its plant program or it might have waited around a little longer just to see if the general uncertainty of things, which affect financing, would clear up a bit. In fact, one of these financial geniuses, who follows the board so closely he can quote almost any stock from memory, suggested to this writer that AT&T just could not afford to wait any longer and might well have done it sooner.

• • •

Coming back to the Washington angle on this telephone situation, it would appear that the Treasury has removed one of the biggest arguments against repealing the high wartime excise taxes which still burden the telephone business. This was seen in the estimate by President Truman of a federal budget surplus of nearly $5,000,000,000 by just this time next year. Up to now, the main argument against repealing the high wartime excise tax has been the claim that no excise tax should be removed as long as the budget remained out of balance. The theory of this was that the principal justification for permitting a hangover of the war excises into peacetime was to shore up treasury revenues against an unbalanced budget. Now the budget is balanced and the excise taxes are no longer needed to get federal income within shooting distance of federal expenditures.

This indirect help from the President follows closely upon the heels of the recent admission by the Treasury Department that communications excises "probably reduce demands for service." It will be recalled that the Treasury observed, after a study of the 25 per cent tax on long distance calls, that they tend to postpone rate reductions rather than decrease profits.

If, as now appears likely, there is a prompt movement in Congress next season to repeal the communications excises, the atmosphere will be a lot more promising for the telephone industry's plans to get rate increases. These increases, in turn, would go a long way towards keeping up the telephone industry's revenues and, as a result, supporting the prestige of its securities.

For that matter, a great part of the telephone industry's program for expanding and improving its plant facilities must be financed out of increased rates. Bell System companies, alone, are seeking $190,000,000 from rate increases before state commissions. Companies in 21 states have already been granted $50,000,000 in rate hikes, applications still are pending for $90,000,000, and other companies are planning to ask commissions for an additional $50,000,000.

Progress of these rate cases through various commissions seems to vary in speed and success from one state to another. In the New Jersey Bell Telephone Co. case, for instance, hearings which began Feb. 10 finally ended on Aug. 21, with proposed schedules having to be altered twice to allow for wage increases negotiated after hearings began. In Tennessee, when state commission officials took weeks to find rate consultants, the Southern Bell Telephone & Telegraph Co. obtained an injunction in a Nashville court permitting a temporary rate increase to go into effect. The state supreme court promptly overruled the lower tribunal, and rates went back to where they had been, pending a hearing Sept. 8. Tennessee Commissioner Leon Jourolmon insisted that his commission was not stalling. In Michigan, state officials predicted a long commission set-to over a request of the Michigan Bell Telephone Co. for $10,400,000 in rate boosts.

By way of contrast, Bell System companies in Indiana and Baltimore, Md., were promptly granted increases of $3,000,000 and $3,500,000 respectively. The Baltimore company, however, was allowed only a 5½ per cent return on its investment. It had requested a rate between 6½ and 7 per cent. There were unconfirmed reports that Chesapeake & Potomac of Washington, D. C., will soon file for a rate increase right here in the nation's capital.

• • •

Some opposition in the grassroots has been noted with respect to the new REA-Bell System contract for spreading farm telephone service through either joint use of poles (with power lines) or carrier telephones. The opposition is not to the principle involved in this contract (which was described in these pages several weeks ago), but rather to the idea that telephone companies should be dealing on a contract basis with individual co-ops, rather than with whole groups of co-ops at a time.

In Texas there is an organization known as the Texas Power Reserve which comprises 95 per cent of all the REA electric co-ops of Texas. This group would like to deal with the telephone industry as a unified concern or association, instead of letting the telephone companies dicker with the individual local co-ops on particular contracts. In any event, Texas Power Reserve has voted to hold off any individual company contracts until the central organization has studied the over-all effect of it on other co-ops.

Of course, the new contract simply has been released by the federal REA from Washington as a model. But the idea was that they would be executed by the single electric co-operatives and particular telephone companies. It will be recalled that the purpose of this contract will be to set up a telephone system within a co-op's territory, either by stringing telephone wires from the co-op's power poles or, in some cases, by giving the co-op the right to string wires from the telephone company's poles. There also was the less likely alternative of using "carrier phone" equipment in connection with existing power lines.

Action of the Texas Power Reserve may slow down progress on contract signings between local companies and co-ops in the Lone Star State. And the question arises whether any such delay is really worth-while. Of course, what the Texas co-op association has in mind is to coordinate the extension of rural telephone service so that it will be on a state-wide basis instead of piecemeal extensions depending on the initiative of local co-ops and local telephone companies here and there.

A somewhat opposite development has occurred in Arkansas where the public service commission discouraged the idea of state-wide action to get telephone service via REA co-ops. The head of the Arkansas state-wide co-op association, Tom Fitzhugh (himself a former member of the Arkansas commission) asked the commission to look into the possibility of launching an REA-Bell contract on a state-wide basis. The Arkansas commission reacted negatively but with a practical suggestion. It pointed to current equipment shortages in the telephone field and said that any study of a state-wide nature would be "premature." In other words, in Arkansas the field is wide open for enterprising co-ops and telephone companies, on their own initiative, to explore the possibilities of advantageous contractual relationship.

A realistic appraisal of the situation is that better progress probably would be made right now if the REA co-ops and telephone companies were to try to get together on their own hooks rather than wait around for state-wide or area-wide organization. There is so little extra equipment available right now that it certainly would not be enough to go around if one or more so-called state-wide programs actually were launched on an executed contract basis. But there still is considerable opportunity for single co-ops to pioneer and see what they can do with the idea of working out both rural power and rural telephone service on a contract basis, mutually advantageous to both the co-op and the telephone company.

Another thing to bear in mind with respect to further delay in rural telephone expansion is the attitude of REA Administrator Claude R. Wickard. He was fairly grudging in his approval of the model contract and plainly indicated that he has not given up the idea that REA co-ops might go into the rural telephone business themselves. And if that came about, it would be without any help from the telephone companies and more likely in competition with a good many of the smaller companies.

But federal REA is busier than the proverbial one-armed paperhanger with the hives trying to wind his wrist watch. Federal REA has just been voted the biggest appropriation in its entire history ($225,000,000) for strictly rural electrification loans. It has just topped the one-billion mark in the amount of such loans made. Despite all this, the backlog of applications for rural electric loans will keep REA occupied for at least another couple of years without any letdown to ponder the need or possibility of going into the telephone business.

If during this period of REA pre-

COMING CONVENTIONS

Michigan Independent Telephone Association, Olds Hotel, Lansing, September 17 and 18.

Rocky Mountain Telephone Association, Newhouse Hotel, Salt Lake City, Utah, Sept. 22 and 23.

Maine Telephone Association, Falmouth Hotel, Portland, Sept. 24 and 25.

South Dakota Telephone Association, Hotel Cataract, Sioux Falls, Oct. 1 and 2.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 14, 15 and 16.

Virginia Independent Telephone Association, Hotel Roanoke, Roanoke, October 30 and 31.

Florida Telephone Association (no hotel selected), November 3 and 4.

South Carolina Telephone Association, Jefferson Hotel, Columbia, November 6 and 7.

Georgia Telephone Association, Henry Grady Hotel, Atlanta, November 10 and 11.

Alabama Independent Telephone Association, Jefferson-Davis Hotel, Montgomery, November 13 and 14.

Missouri Telephone Association, Governor Hotel, Jefferson City, November 17 and 18.

North Carolina Independent Telephone Association, Pine Needles Hotel, Southern Pines, November 20 and 21.

occupation with strict rural electrification, swift progress is made on rural telephone extension, REA may never have any incentive to push seriously into the telephone field on behalf of its co-op borrowers. But if, on the other hand, farm telephone extension in some areas drags along, the situation would be a perfect setup, a couple of years hence, for federal REA to be looking around for more worlds to conquer. Administrator Wickard practically said as much, in his announcement of the model contract, when he plainly intimated that he did not expect the telephone industry to make enough progress (even assuming the desirability of this contract) to warrant REA forgetting entirely about rural telephony.

In fact, some REA officials look on the rural telephone problem as a sort of ace in the hole, to be played some time in the future when REA starts running out of farm electric loans. Unfortunately, it takes two to make a contract and if somebody is organizing these REA co-ops to hang back, it is high time the industry found out who they were and what is the big idea.

• • •

The Taft-Hartley Act may work better as a threat than through active enforcement. A pattern for ending jurisdictional strikes of telephone construction workers was seen as a possibility in the negotiations over New York City's Idlewild airport. For two years a jurisdictional dispute between the International Brotherhood of Electrical Workers (AFL) and the United Telephone Organizations (independent) has held up installation of telephones at this much needed air terminal. The difference between the two unions follows the familiar lines of jurisdictional issues involving telephone work in many other areas of the country. Both unions have demanded sole jurisdiction over the laying of telephone cables.

Early in August a tentative compromise was worked out by Mayor O'Dwyer's labor advisers, which would divide the work between the two groups, somewhere between the perimeter of the air field and the terminal buildings. The AFL union and the New York Telephone Co. agreed, but the independent union bolted at the last minute, causing widespread public criticism. Now, under threat of the Taft-Hartley Act, the independent union has reopened negotiations on a possible compromise. It is believed in some industry quarters that this may establish a pattern for similar compromise elsewhere, since both the AFT and independent unions are anxious to avoid invocation of the Taft-Hartley Act, which, once invoked, would outlaw such strikes.

MRS. WORKMAN PIONEER EXECUTIVE SECRETARY

MRS. MAYME WORKMAN, Springfield, Ill., for the past 18 years traffic supervisor of the Illinois Telephone Association and since 1942 traffic editor of TELEPHONY, on Sept. 1 became executive secretary of the Independent Telephone Pioneer Association, according to an announcement by Walter Dakin, president of the Pioneer association, following her appointment by the board of directors recently.

MAYME WORKMAN

In her new position, Mrs. Workman will have supervision over the business affairs of the Pioneer association. She takes over those duties from G. B. Foscue, a director of the association, who has been in charge of the affairs of the organization since November, 1946, when J. K. Johnston, founder and executive officer of the association since 1920, asked to be relieved of his active duties.

At that time the directors of the association prevailed upon Mr. Foscue to assume the executive duties on a temporary basis until a permanent and full-time officer could be selected. This he agreed to do and the headquarters of the association were moved from Indianapolis to Mr. Foscue's office at 2934 Indian Wood Road, Wilmette, Ill. Effective Sept. 1 the offices were moved to Springfield, where Mrs. Workman will make her headquarters. After that date all Pioneer correspondence should be directed to Mrs. Workman at 304 S. Amos Ave., Springfield, Ill.

Mrs. Workman comes to her new position well versed in the affairs of the Pioneer association. She has been a member since 1932 and has been active in securing new members over the years. At the October, 1946, annual Pioneer meeting she was presented a War Bond given by Secretary Johnston to the Pioneer securing the greatest number of new members.

Also at the 1946 meeting she was elected to the board of directors of the association and later was appointed chairman of its Membership Committee. It is planned that Mrs. Workman will attend as many state conventions as is possible and the national Independent conventions as a representative of the Pioneer association.

Mrs. Workman has had a long and successful career in the telephone industry, beginning in 1907 when she was employed as operator by the old Inter State Telephone & Telegraph Co. in Springfield. In 1909 she became an operator for the Central Union Telephone Co., and in 1920 she was employed by the Illinois Bell Telephone Co. She started with the Bell company as operator, later becoming supervisor, toll chief operator and evening local and toll chief operator.

On Oct. 28, 1929, she was appointed traffic supervisor of the Illinois Telephone Association, which position she held until recently.

While with the Illinois association, Mrs. Workman prepared several traffic manuals for use by Independent companies among which were training guides for PBX operators, chief operators and supervisors; a pamphlet, "Your Telephone Door," and a manual, "Local and Toll Operating Practice for Tributary Offices."

She also is a member of the Traffic Committee of the United States Independent Telephone Association and has conducted traffic conferences at a number of state conventions, and has addressed state and national telephone conventions as well as many civic and business organizations.

In June, 1931, Mrs. Workman began her popular series of articles in TELEPHONY, entitled "The Operator's Corner." These articles have had wide circulation and reprinting and they have been commended highly by operators and traffic executives throughout the industry. Mrs. Workman will continue to serve as traffic editor of TELEPHONY and her articles will be featured in future issues.

Pulse Code Modulation

By
H. S. BLACK*
and
J. O. EDSON*

SYNOPSIS: *A radically new modulation technique for multichannel telephony has been developed which involves the conversion of speech waves into coded pulses. An eight-channel system embodying these principles was produced. The method appears to have exceptional possibilities from the standpoint of freedom from interference, but its full significance in connection with future radio and wire transmission may take some time to reveal.*

Introduction

THIS paper describes an eight-channel transmission system employing pulse code modulation which was developed in portable form for field operation. Other work carried on simultaneously by W. M. Goodall, also of Bell Telephone Laboratories, resulted in the development of an experimental system using a different method of coding. This system is described in a forthcoming paper by W. M. Goodall. A method for pulse code modulation is proposed in a U. S. patent issued to A. H. Reeves.[1]

In carrying out this new type of modulation, the speech wave applied to each channel is, in effect, transmitted sample by sample and each sample is represented by a multi-unit code employing on-or-off pulses, hence the term PCM or "pulse code modulation." Thus, code pulses carry the message in contrast to the continuous modulation of a carrier as in ordinary amplitude modulation, or to the timing or position of pulses as in a pulse modulation[2] system.

The nearly instantaneous samples of the speech wave are taken at intervals sufficiently close together to permit the receiver to produce a faithful re-creation of the original wave. The dependence merely on the presence or absence of pulses gives this new system a high degree of freedom from interference as compared with other types of modulation systems. The system also permits achieving regenerative repeating and thereby prevents noise from adding up from section to section in a long repeatered route.

The conversion of the voice wave into coded pulses involves two principles: *Sampling* and *Quantizing*.

*Both of Bell Telephone Laboratories, Inc., New York City.

Theory of Operation

Sampling Principle. The sampling principle states: If a signal is sampled instantaneously at regular intervals and at a rate slightly higher than twice the highest signal frequency, then the samples contain all of the information of the original signal. This means, if a non-periodic voice wave is plotted, it can be reproduced in all its detail from the values of a set of ordinates erected at equally spaced intervals provided the spacing of the sampling ordinates is less than half the period of the highest frequency component of the original wave. If a voice wave, for example, is passed through a low pass filter whose cut-off frequency is below 4,000 cycles, all of the information necessary for its distortionless reconstruction is contained in a set of very short samples of the voice wave taken at regular intervals at the rate of 8,000 per second. No intrinsic distortion is involved. This sampling principle was used in a previously described[2] microwave relay system using pulse position modulation.

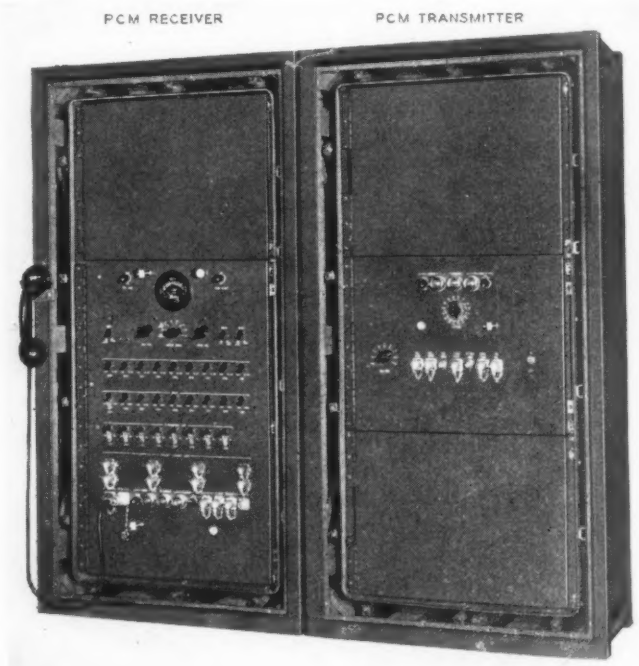


Fig. 1. One terminal of an eight-channel pulse-code-modulation system.

Application of the sampling principle reduces the problem to one of sending a finite number of bits of information giving the magnitudes of the samples of the voice wave. However, this step alone does not permit translation to code because the possible magnitudes of these samples may and generally will occupy a continuous range of values. This difficulty is resolved by a second step: The application of the quantizing principle.

Quantizing Principle. If one experimenter were obtaining points on a curve and calling them to a second person for plotting on a graph, it would be necessary for them to agree upon the precision required. If they agreed to use two significant figures, for example, they might choose coordinate paper with 99 lines above and 99 lines below the axis. Each point then would be plotted on one of these lines. Those experienced in curve plotting would expect to obtain a good likeness to the original smooth curve in spite of the fact that only 199 possible discrete values of sample had been used. Were it desired to communicate this information, it is apparent that each discrete point could be represented by a code character composed of a sequence of on-or-off pulses.

The quantizing principle states: Each of a set of small ranges into which a larger range may be divided is assigned a single discrete number. This number may be that corresponding to the mean of the range. In the example above, any value from —0.5 to +0.5 would be called zero, or the value between 94.5 and 95.5 would be called 95. It is quite apparent that some distortion or granularity is inherent in the application of the principle of quantization to sample of an electrical signal carrying the information of the spoken word. The greater the size of the range assigned to a given character and the fewer characters used, the greater will be this granularity. The problem is to determine the smallest number of steps into which voice signals may be quantized without serious distortion, and what the size of each step should be.

Number and Size of Steps. The range of voltages covered by voice signals, from the peaks of a loud talker to the weak passages of a weak talker, is of the order of a thousand to one. If the range of voltages assigned to each code character were small enough to keep the granularity within desired limits for the weaker passages, and if the range assigned to each character were the same, it would be necessary to assign several thousand characters to positive voltages and a like number to negative voltages, which would require approximately 8,000 different code characters.

By making most of the steps vary logarithmically, nearly uniform percentage precision is obtained throughout the greater part of the range and far fewer steps are needed. It has been found by experience that 16 steps which vary logarithmically give quite intelligible speech; 32 give acceptable quality even if several such systems are connected in tandem; and the granularity introduced by a well designed system using 128 characters is little enough so that the reconstructed speech wave is reproduced to a high degree of fidelity as judged by experienced observers. With binary digits, the number of available characters is two raised to a power equal to the number of on-or-off pulses, called digits, comprising the code. Thus with four pulses, 16 characters are possible, with five pulses, 32 characters, and with seven, 128. Hence, a five-pulse code will give acceptable quality and a seven-pulse code gives very high quality.

To recapitulate, application of the sampling principle permits the reduction of a continuous signal to 8,000 discrete samples per second, and application of the quantizing principle, provided logarithmic steps are used, permits each sample to be represented with sufficient accuracy by a code character which uses one of the various combina-

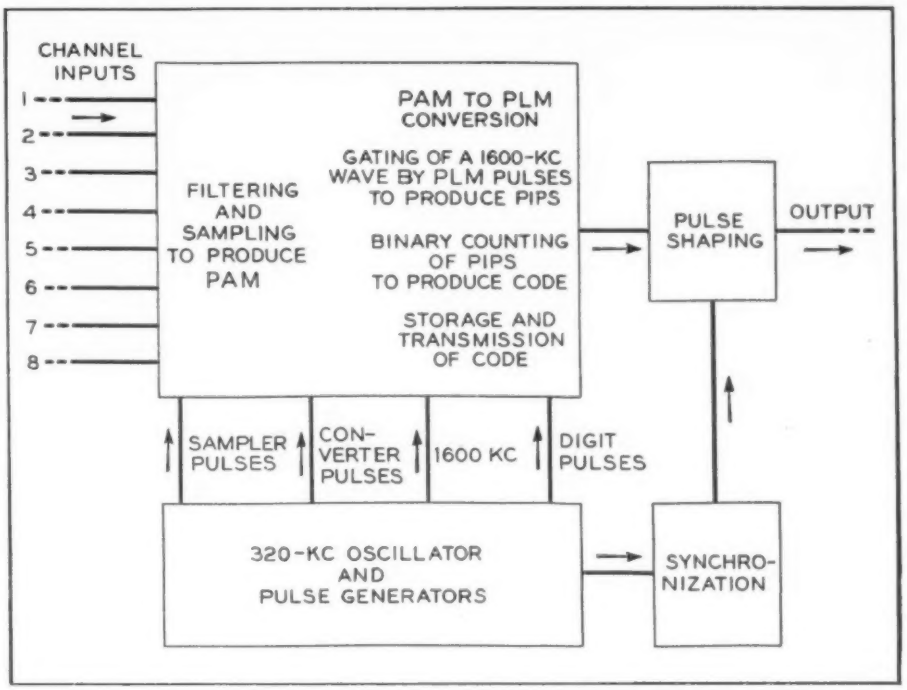


Fig. 2. Functional diagram of pulse-code-modulation transmitter.

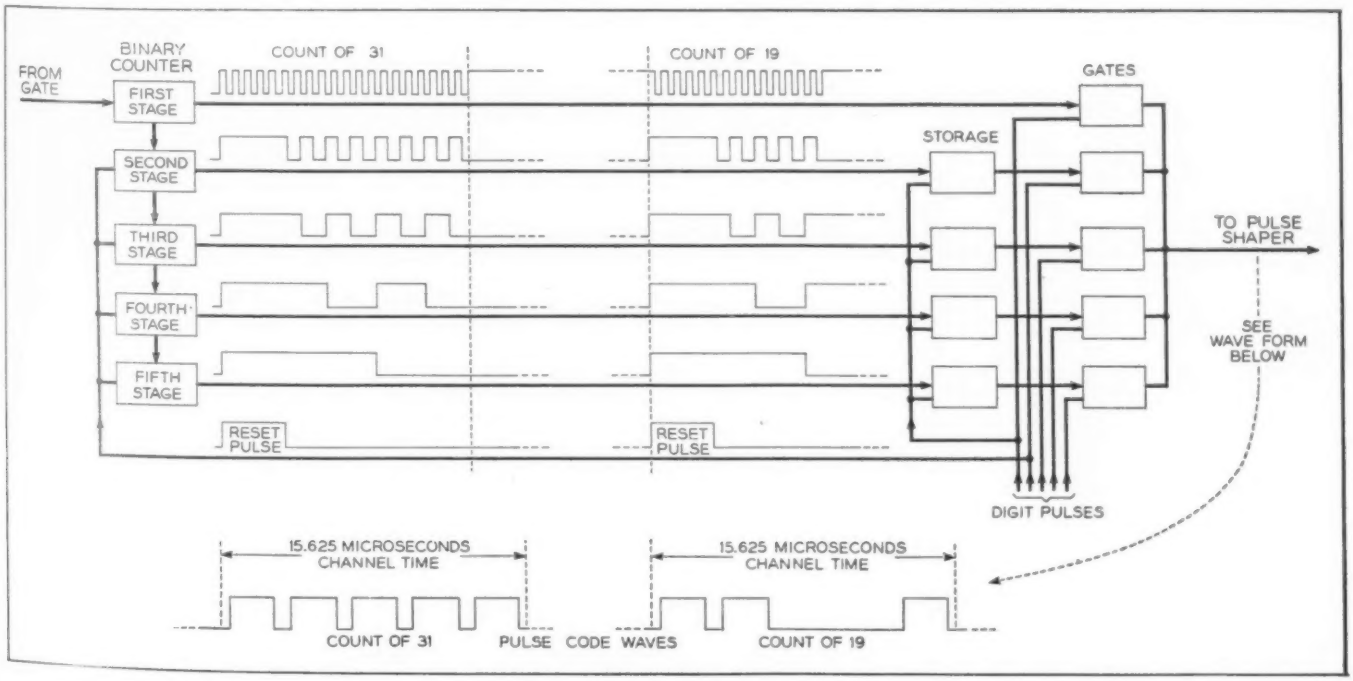


Fig. 3. Block diagram of coder.

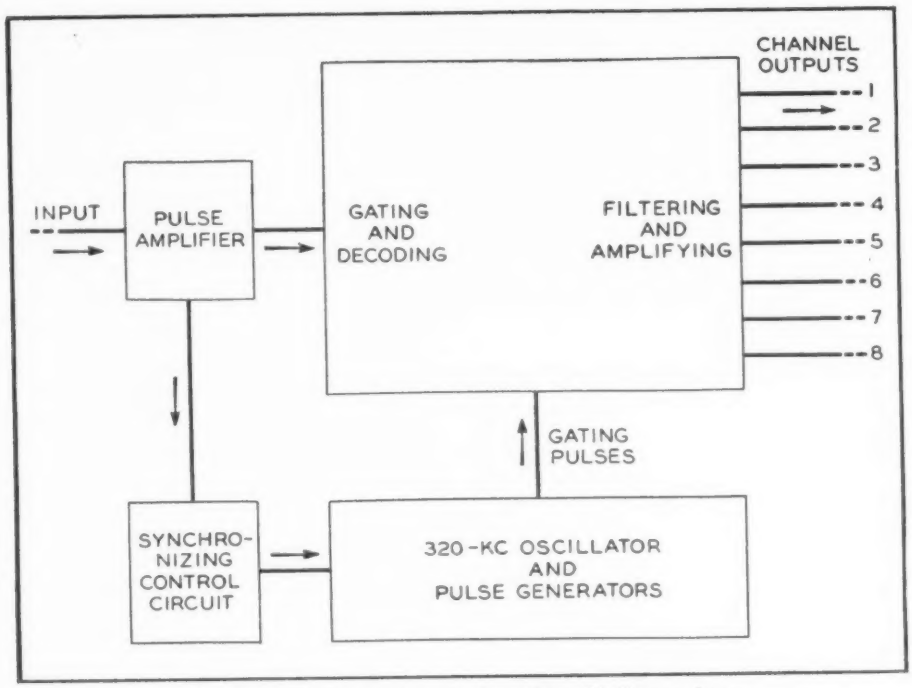


Fig. 4. Functional diagram of pulse-code-modulation receiver.

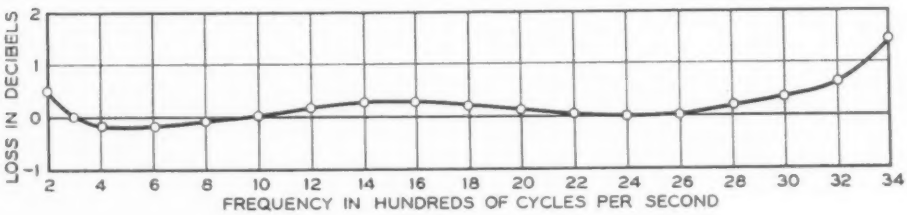


Fig. 5. Typical transmission-frequency characteristic.

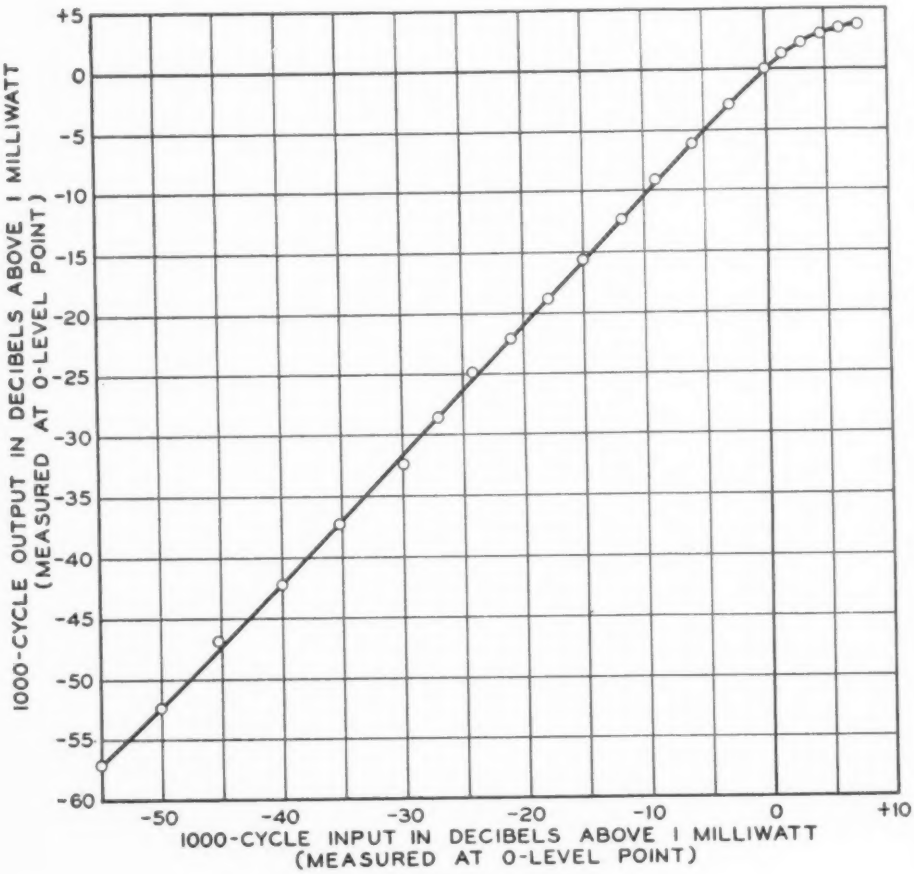


Fig. 6. Typical load performance.

tions of five to seven on-or-off pulses.

PCM Time Division Systems. Pulse code modulation also permits multiplexing the channels by time division.[3] If the pulses are short, so that the five to seven on-or-off pulses comprising one character can be sent in a small fraction of the 125-microsecond interval between characters, the clear time may be occupied by code pulses from other voice channels thus permitting multiplex operation with many channels.

Speed of Operation. A single-channel PCM system carrying speech runs at 8,000 characters per second and the eight-channel system to be described runs 64,000 per second. The pulsing speed is 8,000 x 8 x 5 which is 320,000 on-or-off pulses per second. It is apparent that high speed electronic devices must be used to attain such speeds of operation. A surprisingly large number of such electronic devices as well as many different methods of operation have been proposed.

Method of Operation

Outline of the Method. At the transmitting end, the method of operation depends on the use of a "binary counter"[3,5] to count the number of pulses passing through a "gate" which is opened for a length of time proportional to a speech sample.[1]

In the eight-channel PCM system *(Fig. 1)* which uses conventional radio receiving tubes the following sequence of events, presently to be described in more detail, results in the automatic conversion of speech to code. Looking at the left of *Fig. 2*, the voice signal of each channel first passes through a low-pass filter whose cut-off frequency is less than 4,000 cycles per second. Next the resulting signal is sampled at regular intervals 8,000 times per second. These samples (amplitude-modulated pulses) are converted to pulses of uniform amplitude and variable length.

The length of each pulse is logarithmically related to the magnitude of the corresponding sample. These length-modulated pulses go to an amplifier and turn it on for intervals of time corresponding to the length of each pulse. This amplifier or gate passes a number of cycles of a frequency so chosen that the longest pulse passes 16 cycles more than the shortest. A binary counter counts the number of half cycles and its condition at the end of the count is utilized to produce the desired corresponding code characters.

Essentially, the function of the PCM receiver is to perform these operations in reverse although not necessarily by the same methods. The result is a copy of the original signals but at a later

time. In a well designed system, the accuracy of copy depends chiefly upon the fineness of the steps used in quantizing the samples. During the intervals of time a channel is inactive, there need be no output or noise.

PCM Transmitter. In the PCM transmitter *(Fig. 2)* the timing of all operations is fixed by a 320-kilocycle crystal-controlled oscillator. In the diagram of *Fig. 2*, this oscillator and a five-stage and eight-stage ring counter[6] are included within the block designated "oscillator and pulse generators." The output of the oscillator is coupled to the five-stage ring counter which divides the input frequency by five, producing in each stage of the counter 64,000 output pulses per second. Pulses in the

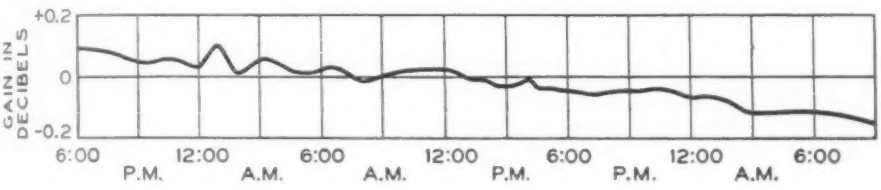


Fig. 7. Transmission stability of 160-mile circuit.

output of a particular stage go to another ring counter which has eight stages and there produce pulses in each stage at the rate of eight thousand per second or every 125 microseconds. Each stage in the eight-stage ring counter produces pulses of 15⅝ microseconds' duration at 125 microsecond intervals and, at any instant, one and only one stage is producing a pulse.

Each voice signal passes through a low-pass filter to a sampler. Each sampler also receives pulses from a particular stage of the eight-stage ring counter. The sampler is designed to deliver pulses whose magnitude is determined by the voice signal and whose time of occurrence is coincident with that of the applied pulses from the ring counter. When a voice signal is applied to any channel input, corresponding positive or negative pulses (samples of the voice signal) appear in the time intervals assigned to that channel. The output from the samplers is a type of signal known as pulse amplitude modulation (PAM).

The coder is designed to operate from length-modulated pulses (PLM). The output of the samplers, therefore, needs to be converted from PAM to PLM and this is done in a converter.

In the converter, a capacitor is charged to a magnitude controlled by the PAM pulse. The time required for the capacitor to discharge to a specified voltage is proportional to its charge. The discharge current generates length-modulated pulses. The leading edges of these pulses, which are represented by the discharge current, recur at regular intervals.

These PLM pulses are used to turn on an amplifier. This amplifier, designated gate, consists of a twin tube whose grids are driven in push-pull by a 1,600-kilocycle sine wave, obtained by generating the fifth harmonic of the 320-kilocycle oscillations. The plates of the tubes are coupled to the first stage of the binary counter and deliver short pulses (pips) at a rate of 3,200,000 per second for the duration of the PLM pulses. These short pulses are counted.

Each stage of the five-stage binary counter *(Fig. 3)* consists of two tubes one of which may be called the odd tube and one the even tube. The circuit is designed so that when either tube conducts, the other does not. Thus, the application of a pulse causes a stage to reverse its position and assume the opposite state regardless of which state it was in. For example, if the even tube is conducting and the odd tube is not, the application of the next pulse causes the even tube to become non-conducting and the odd tube conducting. Coupling between stages is such that a pulse is applied to a succeeding stage only when the even tube of the previous stage is made to conduct. Knowledge of the condition of conduction of either of the tubes tells whether an even or odd number of pulses has been applied to that particular stage.

At the end of the counting interval, to discover how many pulses have been counted, it is sufficient to examine the odd tubes. If the odd tube of the first stage is found conducting, we write down 1 and if non-conducting, 0. If the odd tube of the second stage is conducting, the number recorded is 2 and if non-conducting, 0. Similarly, for the remaining three stages we write 4 or 0, 8 or 0, and 16 or 0 respectively. The number of pulses counted equals the sum of the five numbers obtained in this way. The maximum change in length of the PLM pulse controlling the gate is such that counts from 0 to 31 are possible. With no input to a channel, a count of 15 or 16 is equally probable.

Application of a reset pulse to the counter forces all of the even tubes to conduct, thereby cutting off plate current to the odd tubes. Removal of the reset pulse releases the counter which is then in a condition to count the next series of pulses.

Following each counting period and preceding the reset pulse, the condition of the counter is transmitted to the PCM receiver by sending in succession an on-or-off pulse for each counter stage depending upon whether the odd tube is conducting or non-conducting. The first on-or-off pulse is transmitted under the direct control of the first counter stage. The data from the remaining stages is stored. This is accomplished by charging capacitors, called storage capacitors, under control of the counter stages. Gate tubes acting as amplifiers are coupled to the storage capacitors and are pulsed (turned on) in successive intervals and do or do not deliver pulses as indicated by the condition of each counter stage.

As these pulses from the coder are not uniform in shape or duration, they are applied to a pulse shaper. This pulse shaper consists of a gate, opened or closed by the coder output, and fed by short pulses which recur uniformly at a 320-kilocycle rate. By this means the coder pulses control the release to the line of pulses of uniform amplitude and duration.

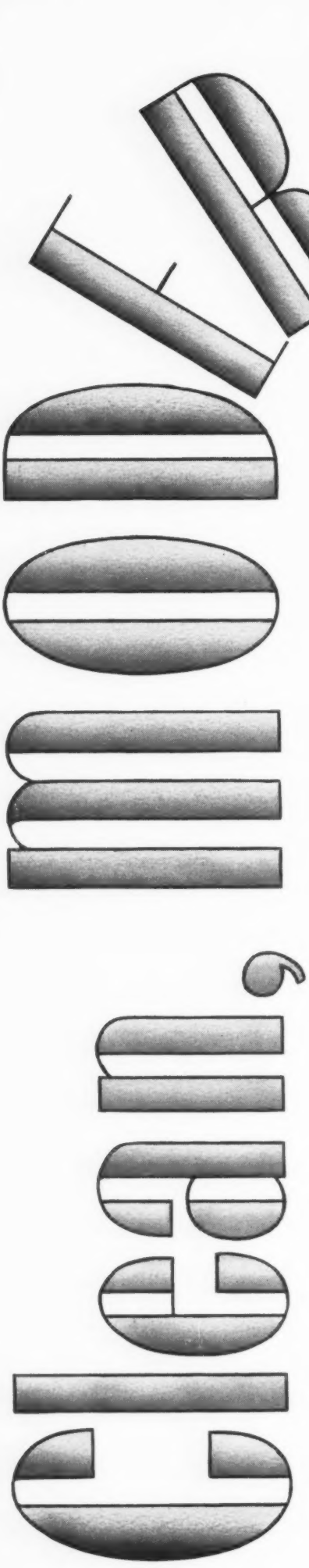
In *Fig. 3* are shown idealized wave forms of the voltage as a function of time at the output of the various counter stages. Time advances from left to right as is conventional for oscillographic presentations.

Synchronization—In order that the eight channels may be separated, it is necessary that the receiver gates should receive pulses of exactly the right frequency and in the correct time relation. The transmitted signal contains a prominent 320-kilocycle component which is selected by tuned amplifiers and limiters to produce a steady 320-kilocycle wave. Suitable gate pulses are produced by dividing this frequency by five and then eight. After division by 40, there are 40 possible time relations between these gate pulses and the corresponding signals from the transmitter, only one of which results in correctly separating the coded signals and routing them to the desired channels. This uncertainty must be resolved by the transmission of a frame marker or other appropriate identification.

In the PCM receiver, the block designated "synchronizing control circuit" *(Fig. 4)* selects the frame marker pulses and prominent 320-kilocycle sine wave which are used to lock the "oscillator and pulse generators" in their required time relation with respect to the received pulse array.

PCM Receiver. For decoding, channels are separated by pulsed amplifiers serving as gates. As previously stated,

(Please turn to page 38)



n Unit e

Automatic Electric Typ47

VOICE-FREQUENCY REPEARS

Here's ***modern*** Voice-Frequency Repeater equipment — bu its for economy and complete flexibility. Simple and inexpensive, i es an economical solution of your transmission problems, on lines ev ort as thirty miles. And you'll find it practical for your purposes — wh have **one** line or dozens!

Type 47 Voice-Frequency Repeaters are adaptable to any t rcuits and method of operation:

Open wire, or cable (loaded or non-loaded)
Two-wire or four-wire lines
Metallic, simplex or composite circuits
Intermediate or terminal stations
D-c or a-c (20-, 135-, or 1000-cycle) signaling—or any desire nation

Repeaters may be supplied with a power panel, for operation -volt, 50-60 cycle a-c (total power consumption is only 25 watts). Or t current may be supplied direct from a 24- or 48-volt a-c or d-c sou plate current from 130- or 160-volt battery.

If you operate toll lines on which voice repeaters are needed, want to know all about this new equipment. Find out how easy it is . . . how very easy to maintain . . . and how it is the most econo y to improve toll transmission. Write us . . . or contact your Auto ectric representative.

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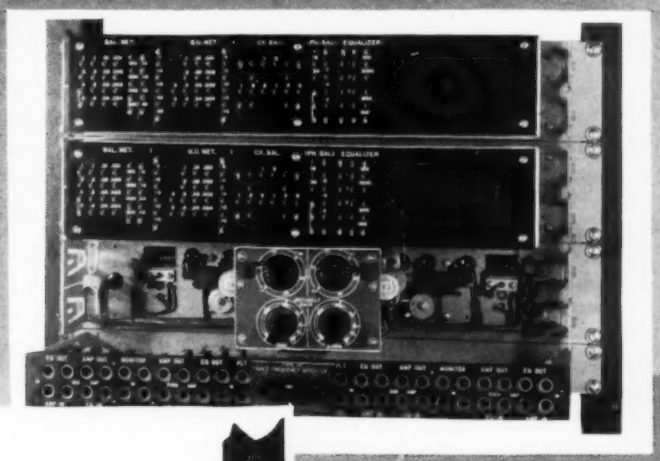
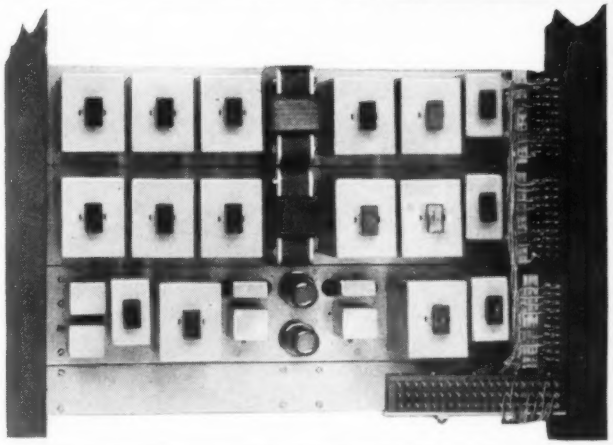
esign!

Balance — Adjust — Test It — FROM THE FRONT!

This is a typical assembly of Type 47 Voice-Frequency Repeater equipment. Terminals of the balancing network are brought out to terminal tags, which may be strapped together as required to secure proper balance; "gain" adjustment is provided as described below.

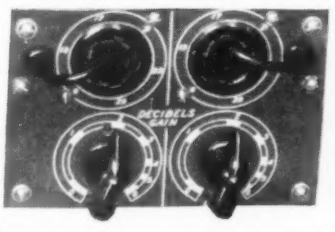
Test jacks are provided for any type of "gain", "singing point", or "monitoring" test; cathode activity and plate voltage tests may also be made. All tests may be performed with the amplifier in the repeater itself, or with a separate amplifier and "pads", as desired.





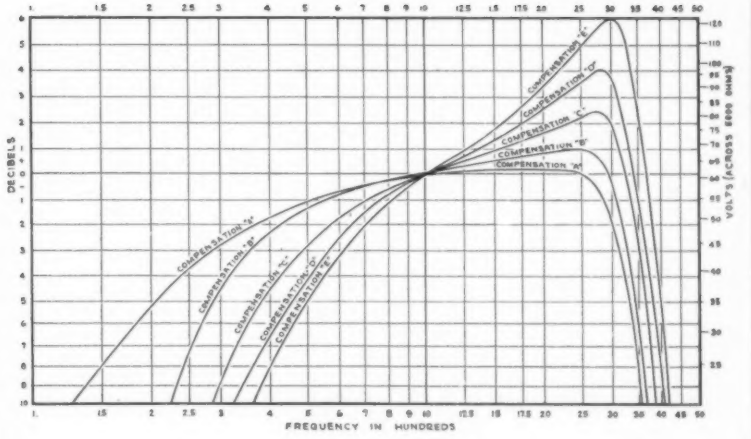
CLEAN, COMPACT ARRANGEMENT

This is a rear view of the Type 47 Voice-Frequency Repeater assembly shown above. All connections to the line and power, and between the unit panels, are made at the small terminal blocks shown at right. Complete assembly requires only 7½" to 15¾", on standard 19" rack.



"DIALED" GAIN ADJUSTMENTS!

Gain adjustment for each amplifier is provided by a pin-ended cord and a potentiometer. When highest practical gain has been secured by adjusting the cord and the potentiometer, the gain obtained may be read directly from the calibrations on these controls.



"TOP" PERFORMANCE!

Stable negative-feed-back amplifiers provide ample gain for any requirements. Adjustable equalizers are provided to compensate for attenuation characteristics of any type of line.

THE PLANT MAN'S NOTE BOOK

BY
RAY BLAIN
TECHNICAL
EDITOR

IF you ride in a radio equipped cab in Washington, D. C., during a rain storm, it sounds like the Chicago wheat pit during a bear raid. Everyone talks at once. A total of four cab companies operate on the same wave length.

Telephone party lines cannot compare with the confusion caused by these four companies all trying to dispatch cabs to parties requesting service on a rainy night. One cabby informed us that he was leaving his receiver turned off until the various companies are assigned separate wave lengths.

The writer rode in several radio equipped cabs in Cincinnati last week and dispatching there was accomplished without confusion. The cabbies all claimed they liked the system.

• • •

The construction of new residences in and around the nation's capital is progressing at a most rapid pace. It is amazing to note how well the telephone companies keep abreast of this tremendous expansion. Telephones are usually provided without undue delay. Aerial cables of small sizes are often strung parallel on one pole lead. This cable has in many cases been used once or twice previously. Party line service is often furnished when individual lines are desired, but it is generally conceded that this is better than being without service entirely.

Without doubt, when things settle down again, much of this haphazard aerial plant will be placed underground and expanded so that individual line service can be furnished to those who are willing to pay for it. Yes, it appears that the telephone business will be booming for many years to come.

• • •

We notice that there is considerable interest in intercommunication telephone service by many large firms especially in manufacturing plants. It does not appear that there is any plan to use intercommunication equipment in an attempt to reduce regular telephone service, but to supplement it. These private systems, it appears, serve a different purpose and handle types of service which would clutter up the regular telephone system and prove detrimental to good service.

• • •

The following is quoted from a manual of evaluation standards for wage board telephone jobs:

"Analysis of telephone disturbances —'Trouble Shooting' is the locating, diagnosing, and clearance of faults. Faults may be defined as any undesirable condition which impairs the efficiency of a communication system. From the electrical or mechanical standpoint, there are two fundamental sources of trouble. They are:—

"(1) A connection where one should not be. This includes shorts, crosses, and grounds.

"(2) No connection where one should be. This includes broken wire, loose connections and high resistance joints."

All this reminds us of the side show we saw at a county fair which advertised a horse with his head where his tail ought to be. We paid our dime and saw an ordinary horse merely reversed in a stall.

• • •

Joe Blow, the installer, has figured out that there is no housing shortage, but just a surplus of population.

"All right, your name is in the telephone book—so what!"
(Courtesy Saturday Evening Post)

A new type of electroplated and drawn wire that can be bent, swaged, hammered or twisted without flaking is now being produced in commercial quantities.

"Fernicklon," the trade name of this new product, is the result of an entirely new process. Metal rods of one-quarter inch diameter are first electroplated continuously with perfect accuracy, then cold-drawn down to diameters as fine as 0.0038 of an inch. One inch of one-quarter inch plated rod may produce as much as 100,000 ft. of plated wire, permitting it to be ordered in continuous seetions of almost any length.

Initial production of this new item includes steel wire with nickel, copper wire with nickel or silver. Die polish or satin finishes are available. Because of its surface perfection and the absolute bond between its constituent metals, this new wire can be subjected to the severest climatic conditions when an anti-corrosive coating metal is used.

PLANT MAN'S QUIZ

Q. What is CR tape and how is it used in connection with cable splicing?

A. This is a two-ply rubber material tape having a layer of vulcanized rubber to which a layer of unvulcanized rubber is attached. When properly applied, CR tape provides a waterproof covering for a splice which seals to itself and the lead cable covering. Deterioration of the high rubber compounds from the effects of sunlight and heat will be only slight for periods up to one year.

• • •

Q. What is considered a fair price to pay for a television receiver?

A. Television sets now on the market are priced from $225 to $2,500 for the most deluxe combination sets. The majority of television receivers, however, will be in the low priced field. Prices vary according to picture size, cabinet design, and also whether the receiver combines radio (AM or FM, or both) and on whether you want a radio-television-phonograph combination.

Several manufacturers have not yet placed their sets on the market and have not quoted prices. In most cases, manufacturers offer generous service guarantees to insure complete satisfaction, and the initial cost of the receiver covers installation and antenna. This last point, however, should be checked with your dealer, since some sets are sold with installation as an extra cost.

• • •

Q. If ground wires are placed on poles to prevent their being shattered by lightning, is it not also true that this ground may prove dangerous to linemen working on the poles?

A. This ground wire at the top of a pole could prove a hazard to linemen under certain conditions. In order to provide protection against lightning and protect linemen, a gap of about one foot may be left in the wire about seven feet above the ground level.

• • •

Q. Is a stop watch considered suitable for timing toll calls?

A. A stop watch could be used for this purpose, but, in our opinion, it would not prove satisfactory since only one call could be checked on each watch. For example, a second call could not be started until the first one was completed. Then, also, a printed record would not be available and the timing of the operator might be disputed by the customer.

The calculagraph is recommended for all timing of toll calls. At the completion of each call, the calculagraph ticket shows a printed record of the starting time of day, the elapsed time, and the date, if required.

• • •

Q. What is a random type cable splice and how is one made?

A. In this type of splice, the pairs are selected at random with no attempt being made to identify the pairs by their count. Pairs are selected and spliced from back to front and from bottom to top so that the splice presents a symmetrical appearance when completed.

When cables contain color groups, the pairs are spliced at random matching, however, color groups to color groups.

• • •

Q. Could plain wooden insulators be successfully used to support open wire circuits on a rural line?

A. Wooden knobs turned from hard wood and impregnated with paraffin were used to some extent for this purpose some years ago, but did not prove successful.

Glass insulators are, in general, considered best and cheapest for telephone work. Even porcelain insulators are not ordinarily considered desirable for this type of work when used to support bare line wire.

• • •

Q. What type tie is considered suitable for attaching cable splices to the messenger strand?

A. The zinc strap type cable hangers are considered highly satisfactory for this purpose and better than a tie.

• • •

Q. Will galvanized steel wire prove suitable for guying corner poles on a rural line or should strand be used?

A. Steel, construction type wire, is often used for this purpose on light loaded rural lines. Number 6 BWG wire of this type has a breaking strength of 1,618 pounds. Suitable strand should, however, be used for guying on heavy loaded rural lines.

• • •

Q. Often we experience difficulty with wooden crossarm pins breaking on heavy corners. Is there a means by which ordinary wooden pins may be reinforced so that they will carry the extra strain of a corner?

A. It is always a good practice to use double arms on corners so that the strain may be divided on two pins. There is available, however, a special type wooden corner pin that is reinforced with a three-eighth's-inch galvanized bolt which extends through the entire length of the pin. An extra large washer two inches in diameter is provided in order that the nut on the bolt which extends through the pin may be tightened, thus anchoring it securely in the crossarm.

• • •

Q. We have a pole line 10 miles in length which is used for connecting two exchanges. We are in urgent need of an additional circuit and prefer to connect a phantom circuit in order to avoid the stringing of another circuit. Is our plan to use a phantom considered desirable?

A. If you do not have nearby power parallels, the phantom circuit will probably prove satisfactory. It will be necessary, however, to properly transpose the two physical circuits that are to carry the phantom and connect the necessary coils. This work may prove as difficult and expensive as stringing a new circuit for the distance of 10 miles.

It is suggested that the use of a single channel carrier system be considered, which can probably be operated over one of your existing lines without difficulty.

THE OPERATOR'S CORNER

BY
MAYME WORKMAN
TRAFFIC
EDITOR

ASSUMING responsibility for our own shortcomings is a good virtue. "Alibi Jane" is never a popular individual with her co-workers, with her supervisors or her chief operator. She is always ready to blame some one else when something goes wrong in the office for which she is responsible. "I didn't know that" — "The supervisor didn't instruct *me* that way," "I forgot" are a few of the common excuses offered by "Alibi Jane."

When something goes wrong, it is always a good idea to find out if *we* are responsible before placing the blame upon someone else.

Once upon a time there was an irascible old man who incurred the ill-will of a group of boys in the neighborhood, and in an effort to retaliate for some of their fancied grievances against him, the youngsters arranged a unique revenge.

By some chance the lads had come upon the body of a dead skunk. At the price of great self-control, and to the accompaniment of much laughter and not a few violent exclamations, the boys managed to fasten the dead animal under the hood of the old man's automobile, just above the motor. Having managed to do it, they retired to a place of safety and watched him drive away, but they had to depend upon their imagination for most of their satisfaction, for he was out of sight in less than two minutes.

When the old gentleman first got into his car he detected the odor, but assumed that it originated somewhere in the neighborhood, and gave it no more thought. As he drove down the street, however, the heat from the motor had the effect of stimulating even a dead skunk, with the result that the hot-tempered old fellow never got out of its "neighborhood."

His errands for the afternoon were all confined to an area no more than a mile square, and all afternoon he suffered from the unpleasant odor. He blamed the police, and wondered why they did not do something. He called the city health department and registered his complaint. He raved to one of the neighbors about the neighborhood. And all the time the trouble was under his own hood!

I guess it would be a good idea for all of us to look under our "own hoods" occasionally and do a little exploring. The result might be enlightening. An operator in an office may be of the opinion that the girls in the office are aloof. They don't seem to be very friendly. If she will look under her own hood she may find she is responsible for their actions.

An operator who finds it difficult to get someone to exchange hours with her may blame the girls in the office for this situation, but if she will look under her own hood she may find it is because she is never willing to accommodate any one else when *they* wish a favor.

If the girl who always grumbles when she is assigned a late trick will look under her hood, she will probably find she is only receiving her fair portion of late tricks.

If an operator asks to be excused for a day or a portion of a day and the chief operator is unable to grant her request, instead of berating the chief operator for her actions, why not do a little exploring? She may find this is the only time her request was not granted.

When a supervisor is having difficulty with an operator, for example, when she is not receiving the desired cooperation, or when she is having trouble because the operator will not observe the rules of central office etiquette, looking under her hood may reveal the answer to the problem — she may remember, she too, failed to observe the rules of central office etiquette while working at the switchboard.

"Hello . . . John-n-n, darling . . . ?"

A chief operator may complain that her supervisors are not cooperative. Looking under "her hood" may be enlightening. "It is true, I always tell them about their shortcomings, but never give them a word of praise for a job well done."

A manager may be dissatisfied with the service in the office, thinking, "Mary must be slipping. She used to be a good chief operator, too." If the manager will look under "his hood" he may find Mary's attitude may be due to his lack of interest in the traffic department and that Mary is just as efficient in her work as she has been in the past but she does not have the necessary equipment or trained personnel to do a satisfactory job.

"Hood Inspection" can and it probably would be an interesting and revealing experience. It would also eliminate many fancied grievances and create a more pleasant atmosphere in the central office.

Questions from Illinois Operators

(1) Has the practice of requesting the distant operator to "keep ringing" been resumed?

(2) How often should you tell a subscriber the line is busy before you "hurry" the line?

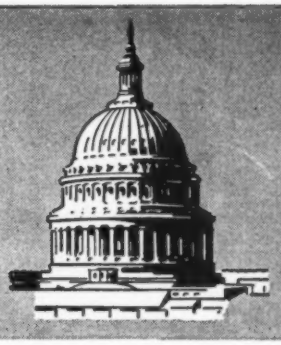
(3) When a tributary office passes a ticket to the toll center, is it necessary for them to give the name of the calling person or company name?

(4) When should the filing time on a ticket be changed?

(5) Is it permissible to have point-to-point operators defer making subsequent attempts for a short time so that these operators may assist in recording?

Answers to these traffic questions are presented on page 37.

COURTS and COMMISSIONS



Rate Cases Crowd Nebraska Commission's Agenda

Rate cases continue to crowd the agenda of the Nebraska State Railway Commission which has approved increases for the Petersburg (Neb.) Telephone Co. and the Merriman (Neb.) Telephone Co., established new charges at the recently reopened Lewellen exchange of the Platte Valley Telephone Corp., Scottsbluff, and will hold hearings on three other rate petitions.

The Petersburg company will put into effect Sept. 1 the following schedule of gross rates: Business, individual, increased from $2.50 to $3.00; residence, individual, from $1.75 to $2.00 and rural, grounded, from $1.75 to $2.00. Service station net rates, individual, from $1.60 to $1.80; service station, two, from 80 to 90 cents and three or more, from 55 to 60 cents.

The company has a paid-up capital of $6,000, and is owned by three persons. Until 1945, when it had net earnings of $196.20, the exchange usually was operated at a loss. In 1946 it earned only $32.17. The 1946 subscribers' revenue was $2,111, which the new rates will increase $531.60 per year. Toll revenue in 1946 was $1,344, and for the current year is reduced 20 per cent to $1,075.06. The commission increased maintenance estimates 10 per cent and operators' wages 20 per cent. In 1946 total revenues were $4,313, and operating expenses $3,927.

The Merriman company, owned and managed by Mrs. Gladys J. Whipple, on Sept. 6 will increase town service monthly rates 75 cents and rural party service 50 cents.

The new rates are estimated as producing additional revenues increasing the 1946 operating income from $4,548.30 to $5,061.30. The commission found that disbursements have steadily increased, from $1,762 in 1941 to $3,978 in 1946.

Rates for the Lewellen exchange of the Platte Valley company, which was allowed to reopen, establish a dial service and reestablish all rates in effect when it was discontinued on May 1, 1934 (TELEPHONY, July 19, p. 27) are: Business, individual, wall, $3.75; residence, individual, wall, $2.00; rural 10-party residence, wall, $2.00; business joint user, $1.00; residence, joint user, 50 cents; desk sets, 25 cents, and handset 40 cents.

Set for hearing Oct. 1 is the application of the Southeast Telephone Co. of Falls City for authority to adjust its rates and charges for present service and to establish rates for dial service, effective when conversion has been completed (TELEPHONY, July 26, p. 32). On October 8 the commission will hear application of the Hooper (Neb.) Telephone Co. to increase service rates 50 cents a month (TELEPHONY, Aug. 9, p. 29).

Not yet set for hearing is the request of the Thomas County Telephone Co. of Dunning to increase monthly rates $1.50 net per subscriber at its Brownlee dial exchange.

V V

Central Telephone Asks Increase in Minnesota

Hearing on request of the Central Telephone Co., Sioux Falls, S. D., for authority to increase monthly rates at 14 Minnesota exchanges has been set for Sept. 5 before the Minnesota Railroad & Warehouse Commission.

Higher rates are sought at Balaton, Canby, Dawson, Edgerton, Farmington, Lakefield, Lake Wilson, Lewisville, Madison, Sherburn, Slayton, Triumph, Truman and Welcome, and range as follows: *Business*, individual line, from 50 cents to $1.00; two-party, from 50 cents to $1.00; *residence*, individual line, from 50 cents to $1.00; two-party, 50 cents at all exchanges except Lakefield where $1.00 increase is asked; four-party, 50 cent increase; business, extension stations, 25 to 50 cents and service stations, from 25 to 45 cents.

Rural, business, eight-party service, metallic, for Dawson only will be raised from present $2.75 to $3.25 and *residence*, from $2.25 to $2.75. *Business*, four-party for Triumph, from present rate of $2.50 to $3.25. *Rural, business*, multi-party, metallic, for Farmington, from $1.50 to $2.00; all other exchanges, from $2.00 to $3.00; grounded, Slayton only, from $1.75 to $2.75. *Rural, residence*, multi-party, metallic, Farmington, from $1.50 to $2.00; all other exchanges, from $2.00 to $2.50; grounded, Slayton only, from $1.75 to $2.25.

V V

Indiana Telephone Corp. Increases Rates

The Indiana Telephone Corp., Seymour, Aug. 21 was granted authority to increase its rates a total of $175,000 in 32 southern Indiana communities.

The Indiana Public Service Commission, refusing to consider the company's prediction of lessened toll call revenue, pared the increases from the $192,800 originally asked.

Varying rates will be established in the 32 exchanges, the commission said.

J. B. Bailey, chief rates examiner for the commission, said the order gives the company a 6 per cent return on a fair cash value. He said before the increases become effective, the company must certify it has granted $72,000 in annual wage increases to its 300 employes. Increased labor costs were cited by the company in support of its petition for the increase.

Mr. Bailey said the revenue of the company last year totaled $720,308.

V V

Asks Ban on Toll Charges For County-Wide Service

Lincoln (Neb.) Telephone & Telegraph Co. should be required to set up county-wide service free of toll charges, according to a petition filed by the Nemaha County Farm Bureau with the Nebraska State Railway Commission, which now has pending the Lincoln company's application for higher rates. (TELEPHONY, Aug. 23, p. 24.)

The petition states that as a result of changed agricultural conditions, the farmer may reside near one town but his roads, telephone service, schools, medical facilities, etc., may be tributary to another. Mechanization of the farm means contact wtih manufac-

turers and government agencies which largely have their offices in the county seat.

The petition deems it "highly important that the ease and facilities of telephoning throughout the county be extended to farming operations. This is true not only for the calls the farmers make, but calls that schools and other agencies and business make to the farmer. Our farmers recognize that they would rather pay it in one rate than on a rate plus tolls. On out of county calls we need to pay a toll charge."

V V

Resume New England T&T's Connecticut Rate Hearing

Hearings in the Connecticut rate increase petitions of the Southern New England Telephone Co. (TELEPHONY, June 21, p. 22) were resumed Aug. 19 before the Connecticut Public Utilities Commission at Hartford.

Other commission action for New England includes authorization by Maine's commission of an increase for the New England T&T of approximately $112,500 per month, a modification of the company's initial petition; New Hampshire increases were estimated at $65,000 per month. The recent increase granted New England T&T by the Massachusetts commission (TELEPHONY, Aug. 2, p. 26) aggregating $405,000 per month brought forth the information that company earnings fell from $6.01 to $4.18 per share for the first half of 1947, compared with the same period a year ago, notwithstanding a gross revenue increase of $4,926,815, or 7.9 per cent.

V V

Nebraska Commission Approves Bell Mobile Service Rates

Nebraska's State Railway Commission has established a schedule of rates for mobile telephone service rendered by the Northwestern Bell Telephone Co. Service will be furnished initially in the Omaha mobile service area, which is made up of all exchanges in Nebraska and Iowa within an approximate distance of 25 miles from Omaha.

In view of the existing uncertainty concerning jurisdiction over rates and services of the new unit, a similar petition has been filed with the Federal Communications Commission.

Minimum monthly service charge for the first mobile unit, including one directory listing and 120 dispatching service message units is $7.00. With $2.50 for each additional unit to the same customer; for signaling service, first mobile unit, $5.00 a month, including 80 signaling service message units, $5.00, and for each additional unit to the same customer, $2.00. At the option of the customer, radio equipment on units will be provided, installed and maintained by the company, for which the installation of general or dispatching service is $25 with a monthly charge of $15; for installation of signaling service, $12.50 and a monthly charge of $7.50. The schedule also includes message rates for person-to-person and station-to-station calls, as well as other services.

The commission also authorized the Lincoln (Neb.) Telephone & Telegraph Co. to establish mobile telephone rates and service, with a formal order to be prepared later.

V V

Name Omitted from Directory; Sues For $10,000

John R. Huffman, Canton, Ohio, filed suit against the Ohio Bell Telephone Co. Aug. 13 for $10,000 in damages he claimed to have suffered when his name was omitted from the company's 1946 directory.

Mr. Huffman, who operates a window shade manufacturing repair and installation service, asserted his business address was omitted in the regular white page section, and that his name and business were entirely ignored in the classified section.

V V

Three Minnesota Independents Increase Rate Schedules

In orders issued Aug. 18, the Minnesota Railroad & Warehouse Commission approved rate increases, effective Aug. 31, for the Akeley (Minn.) Telephone Co. and the Deer Creek and Bertha companies at their Deer Creek, Bertha and Hewitt exchanges.

The Akeley company, which had requested a 50-cent monthly increase on all business and residence rates, was granted a 25-cent boost. Its proposed rural multi-party increase from $2.00 to $2.25 was granted, but no additional charge was approved for extension stations, which remain at $1.00 net.

In submitting its petition, the Akeley company presented the following operating figures under present rates: Revenues, $4,781 against expenses of $4,167 for a net income of $614. Under proposed gross rates: Revenues, $5,216 against expenses of $4,189 for a net income of $1,027 or 4.2 per cent of depreciated book cost, valued at $24,420.

The commission's adjustment of operating revenues and expenses shown by the petitioner was as follows: Revenues, $4,907; expenses, $3,684, for a net income of $1,223 or 5 per cent of depreciated book cost.

Because of the failure of the Deer Creek and Bertha companies, which are owned and managed by W. H. Millner, to keep their operating expenses segregated properly, it was thought best to combine the two, arriving at reasonable costs.

The following rates were granted for all exchanges: *Business*, one-party, $3.75; two-party, $3.50; *residence*, one-party, $2.50; two-party, $2.25; four-party, $2.00; *rural*, multi-party, metallic, $2.25, all subject to a discount of 25 cents a month if paid before the 15th of the month. Rates at Hewitt service stations are 50 cents net. These figures for the most part agreed with those requested for Bertha and Hewitt and were 25 cents lower than those sought for Deek Creek.

Company figures under present gross rates were: Operating revenues, $13,971 against expenses of $14,049, for a deficit of $78; under proposed gross rates, revenues, $16,348 against expenses of $14,796, for a net income of $1,552 or 4.5 per cent of depreciated book cost of $34,481. The commission's adjustments on the latter figures brought them to the following: Revenues, $15,916 against expenses of $14,178 for a net income of $1,738 or 5 per cent of depreciated book cost.

V V

Michigan Rates Increased

Application of the Clayton (Mich.) Telephone Co. for increased rates to meet higher operating expenses was approved for filing with the Michigan Public Service Commission in the commission's order of Aug. 12. For the base rate area within the corporate limits of Clayton, the following quarterly rates will be established: Individual line, $6.00; unlimited party line, $5.00. Outside the base rate but within the exchange service area, unlimited party line quarterly rates will be $5.00. A discount of $1.00 per quarter will be allowed on all customer-owned instruments.

V V

Mobile Licenses Extended

The Federal Communications Commission on Aug. 15 extended the license term of all general mobile Class 2 experimental licenses to Nov. 1, 1948. Original term extended to Nov. 1, 1947, and licensees applying for renewal were required to do so prior to Sept. 1.

V V

Rate Hearing Set

A hearing on a rate petition of the Indiana Associated Telephone Corp., LaFayette, has been set by the Indiana Public Service Commission for Sept. 8.

Illinois Allied Case To Be Heard Sept. 8

The Illinois Commerce Commission suspended a proposed rate increase by the Illinois Allied Telephone Co., Princeton, and scheduled hearing for Sept. 8.

The increase, which would boost the company's exchange revenue about 15 per cent, is being opposed by the Illinois Agricultural Association and representatives from the towns of Princeton, Walnut and Spring Valley.

The company has 12 exchanges and serves 28 communities in Illinois.

V V

Applies for First Rate Increase in 24 Years

The Kaplan (La.) Telephone Co. Inc., has applied to the Louisiana Public Service Commission for an increase in rates, pleading that the present rates, in effect for the past 24 years, are insufficient to maintain standard telephone service, according to E. J. Hebert, manager.

Mr. Hebert stated in the petition to the commission that his company had been improving the facilities of its outside plant for the past seven or eight years by replacing iron wire with modern cables and installing additional cables, and making preparations for a new inside plant.

He said the telephone company had tried to maintain satisfactory service in spite of losses the past few years. He further stated the company had acquired the necessary material to put up a new toll circuit from Kaplan to its toll center in Abbeville, and that work would begin on the line in the near future.

V V

Asks Higher Rates for Common Battery Service

The Michigan Public Service Commission on August 19 ordered the Southern Telephone Co. to file rate sheets conforming substantially with the proposed rate schedule which the company filed on July 11.

In the past the company has offered only magneto telephone service but is requesting a 25 cent raise since subscribers are now requesting common battery service. The company serves 326 stations in the town of Brooklyn and Jackson and Lenawee counties.

V V

Service Questioned

The Arkansas Public Service Commission on Aug. 14 ordered the Prescott Arkansas Telephone Corp., Prescott, to show cause at a hearing on Sept. 10 why it should not provide adequate service to customers at McCrory and in the surrounding area.

V V

New Michigan Bell Exchange

The Michigan Bell Telephone Co. Aug. 18 petitioned the Michigan Public Service Commission for permission to establish a new exchange at Rock.

V V

New Foreign Exchange Rates

The Tri-County Telephone Co., South Haven, on Aug. 14 was authorized by the Michigan Public Service Commission, to establish a revised rate schedule for foreign exchange service.

V V

Appointed to Connecticut PUC

Henry B. Strong has been made a member of the Connecticut Public Utilities Commission, succeeding Joseph P. O'Connell of Bristol.

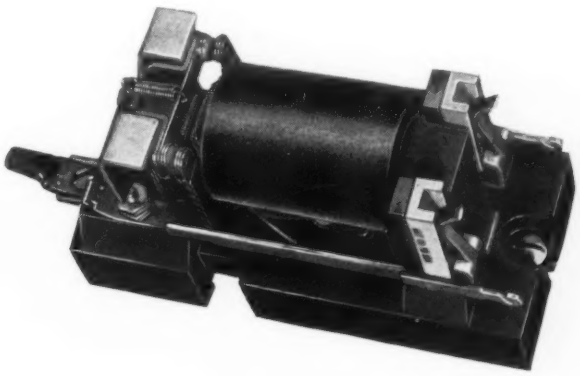
V V

Inadequate Service Complaints

Hearing on the alleged inadequacy, inefficiency and insufficiency of the telephone service and equipment maintained through its Madison and Tallahassee exchanges by the Southeastern

FAHNESTOCK ELECTRIC COMPANY, INC.

Type 3-A Arrester Relay



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Write for circular regarding the 3-A arrestor relay.

Protection for POLES AND CROSS-ARMS — old or new

Chapman "Penta" Preservative is rapidly winning acceptance as the preferred material for pressure-treatment of wood which is to be exposed to moisture and insects. Tests prove its superior qualities. Linemen and other workers like it because the poles are clean—not sticky.

"Penta" Preservative can be sprayed or painted on poles, cross-arms or other timber already in place, or treatment can be by soaking if pressure equipment isn't available. In the absence of pressure treatment, non-pressure methods with "Penta" Preservative are very useful either for new stock, poles and timber in service, or reclaimed poles and cross-arms.

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"Penta" Preservative contains *Pentachlorphenol*, a product of *The Dow Chemical Company*.

Telephone Co. of Tallahassee has been set for Sept. 11 and 12 respectively by the Florida Railroad & Public Utilities Commission.

V V

Summary of Commission Rulings & Hearings

Kansas Corporation Commission

Aug. 25: Investigation to determine whether adequate service is being rendered in the communities served by the Johnson County Telephone Co., Gardner.

Sept. 8: Hearing on application of the Farmers Telephone Co., La Crosse, for authority to change rates at La Crosse, McCracken and Nekoma.

Sept. 8: Hearing on the application of the Viola (Kan.) Telephone Co. for permission to transfer its franchise and to cease operating as a public utility.

Sept. 8: Hearing on the application of W. F. Hanlon for permission to operate a public utility in Viola and vicinity.

Sept. 9: Hearing on application of Weir City (Kan.) Telephone Co. to cease operation.

Sept. 9: Hearing on application of Bernard L. Farrell for authority to operate public utility in Weir and surrounding rural district.

Sept. 9: Hearing on application of Maize (Kan.) Telephone Co. for: (1) Permission to transfer its franchise and cease operating as a public utility at Maize; (2) permission to operate public utility at Maize, Kansas and Park cities and Delano, Union and Attica townships.

Sept. 12: Hearing on the application of the Jetmore (Kan.) Telephone Co. for authority to change rates in Hodgeman County.

Sept. 12: Hearing on application of the Western Light & Telephone Co. Inc., Kansas City, for authority to change rates at Waterville.

Sept. 12: Hearing on application of Langdon (Kan.) Telephone Exchange for permission to transact business of a public utility.

Sept. 12: Hearing on application of the Leoti (Kan.) Telephone Co. for authority to change rates at Leoti and Wichita.

Oklahoma Corporation Commission

Sept. 5: Hearing on application of Newport Heights residents requesting their territory be declared open, enabling them to receive service from the Southwestern Bell Telephone Co.

Sept. 12: Hearing on application of Gotebo (Okla.) Telephone Co. for increased rates.

Sept. 12: Hearing on application of residents of Stigler asking (1) that Southwestern Bell Telephone Co. provide adequate service; (2) for an adjustment of business and residential rates.

Sept. 12: Hearing on application of Southwestern Associated Telephone Co., Lubbock, Tex., for increased rates at Texhoma, Okla.

Sept. 12: Hearing on application of Tryon (Okla.) Telephone Co. for increased rates.

Hearing date not set: Application by residents of Wayne for investigation of service by the Southwestern States Telephone Co. of Brownwood, Tex.

Wisconsin Public Service Commission

Aug. 27: Hearing on application of Menomonee Falls (Wis.) Telephone Co. for authority to install a switchboard and convert from magneto to common battery service.

Aug. 29: Hearing on application of the Mondovi (Wis.) Telephone Co. for authority to purchase the property of the Drammen-Naples Telephone Co. and of the Naples Telephone Co.

Sept. 3: Hearing on adequacy of service complaint of Martin Burns et al v. Bristol Telephone Co. of Webster.

Sept. 3: Hearing on application of Almond (Wis.) Telephone Co. for authority to increase rates.

Sept. 4: Hearing on application of Badger Telephone Co. of Neillsville for permission to sell property at Webster.

Sept. 4: Hearing on application of Cumberland (Wis.) Telephone Co. for authority to increase rates.

V V

AT&T Plans $354 Million Of New Financing

Creation of the largest issue of convertible debentures in the history of corporation finance, and topped only by the huge security offerings of the federal government, was recommended by the directors of the American Telephone & Telegraph Co. on Aug. 20.

The new AT&T issue will total in excess of 354 million dollars. The directors also declared the usual quarterly dividend of $2.25 a share of capital stock.

In the last 15 months the AT&T has marketed $868,087,700 of debentures. The last, 200 millions of 40 year 2⅞ per cent debentures, were sold in June. Another issue of the same amount, maturing in 35 years and bearing a 2¾ per cent coupon, was marketed in March.

Last December the company offered stockholders the right to purchase $343,087,700 in 15 year 2¾ per cent convertible debentures of which all but $12,878,900 were taken by shareholders. This spring the company increased its authorized capital stock from 25 million to 35 million shares.

Directors recommended that the new issue of debentures be offered to stockholders in the ratio of $100 of debentures for each six shares of stock held. A special stockholders' meeting will be held Oct. 15 to act on the proposal.

Proceeds from sale of the debentures and from conversion of them into stock would be used to provide funds for extension, additions, and improvement to the plant of AT&T and its subsidiaries and associated companies, and for general corporate purposes.

V V

Ends Long Telephone Career

MARY HILGER was only 18 when she took her first job with the Illinois Consolidated Telephone Co. at Litchfield. Recently, forty-one years later, her resignation marked the close of a long and happy career.

Series 25T (½ ton chassis)
and 35T (¾ & 1 ton chassis)
Telephone Installation & General Service Body

ALL-STEEL

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PUBLIC UTILITY BODIES

EMERGENCY or ROUTINE Telephone Installation and General Service Work

LINE BODIES • SERVICE BODIES • POLE TRAILERS • SPECIAL EQUIPMENT

McCABE-POWERS AUTO BODY CO., 5900 N. BROADWAY, ST. LOUIS 15, MO.

Over 75 years experience!

Person-to-Person

It Ain't No Sin

"NICE people" just didn't admit to listening in on a party line, although the little clicks you heard when you twirled your crank and listened for the operator weren't made by crickets. But the practice was acknowledged recently by a subscriber to a little Michigan Independent, the Citizens Telephone Co. of Berrien County.

The account, which appeared in the Chicago (Ill.) Tribune's "Front Views and Profiles" column, brought forth a letter from one Emeline O. D. who resides close to the University of Illinois and so, by virture of breathing that rare scholastic air, must be regarded as a person of culture and refinement. Rather than a sin, says Emeline, "listening-in actually shows a sincere interest in what goes on about a person. . . .

"The ear of the rural dweller must help take in the community goings-on just as the eye of the town and city dweller must register its fair share and more of the happenings in the street." She proudly claims that in a voice as hearty as any native she can give out "wire-garnered news" with the authority of a U. N. expert.

Of course, there are lots of other cultured persons, all motivated by the same sincere desire to learn what goes on about them. So when Emeline's receiver is accidentally off its hook or the cord has crawled across the telephone in such a manner that the replaced earpiece fails to disconnect, her life may become, in its turn, an open book. And there are lots of folks who never got around to reading "Forever Amber," only because lending libraries charge a nickel a day. But for free—well!

General's Unfilled Orders Up Despite Big Station Gain

During 1946, subsidiaries of General Telephone Corp. gained 70,046 telephones, and during the six months ended June 30, 1947 the gain was 47,080. At that date the company-owned stations of the General system totaled 882,830; in addition, 17,705 customer-owned telephones were served.

Notwithstanding these gains, there were approximately 113,400 unfilled applications for service on June 30, compared with 79,000 on Dec. 31, 1945. During July, 1947, there was an additional gain of 5,908 telephones.

H. V. Bozell, president of the General Telephone Corp., reports that, subject to receiving materials as scheduled and to maintaining required manpower, the General system expects that construction during the last half of 1947 will total approximately $20,611,000.

V V

Macon, Mo., Meeting Draws Large Attendance

Approximately 150 members of the Missouri Telephone Association met at Macon Aug. 13, marking the largest attendance of the three-day summer conference of representatives of the Central Missouri area. The meetings began Aug. 12 at Cameron and concluded Aug. 14 at Rolla.

The welcoming address was presented by C. W. Gottry, general manager of the Missouri Telephone Co., which was host at the Macon meeting.

Two concurrent afternoon sessions were conducted. Henry Altepeter, St. Louis, district plant superintendent for the Southwestern Bell Telephone Co., was in charge of the plant meeting, while Frank Pyle, Hannibal, district traffic superintendent for Southwestern Bell, led the traffic discussion.

Judge Kyle Williams, Jefferson City, senior member of the Missouri Public Service Commission, stressed "the importance of keeping adequate records so that the public service commission can make proper decisions on questions of rates.

"The public service commission has recognized the need for rate increases in a great many cases," Judge Williams stated. He also outlined recent inspection trips of experimental laboratories and manufacturing plants of the telephone industry by the commission.

R. W. Hedrick, Jefferson City, secretary of the Missouri Telephone Association, spoke on "Public Relations."

50 YEARS OF PROGRESS

The USITA will celebrate its Golden Anniversary at its annual convention, Oct. 14-15-16 at the Stevens Hotel, Chicago. Let's make it a record convention.

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chance pike pole

The new Chance Reversible Point Pike Po features a removable point, made in separate piece, flat on one end with a gi let point on the other. A spring catch in th ferrule holds the point in place.

When carrying the pole on the truck, th point is inserted point-first into the ferrul thus eliminating the hazard of shar projections.

The gimlet or spiral point holds witho slipping. When worn, it can easily be re placed without buying a complete new pi pole. Pole splitting under strain is great reduced through the means by whic the ferrule is attached to the pole. The ba of the pole is also protected by a pole ban

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RCARLSON Recommends

build for permanence and economy *with poles bearing this trade-mark*

The T. J. Moss Tie Company's creosoted southern yellow pine poles are time-proven.

Every pole is full-length pressure-treated in accordance with American Wood Preservers' Association specifications.

MTCo

The Stamp of Character

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cook type 7 *high-potential lightning arrester*

Outdoor pole type arrester provides lightning protection and atmospheric static drain for five pairs of open-wire circuits, or for drop wires and cables leading to unprotected terminals.

Equipped with:

1. Single piece molded Bakelite insulation and fanning strip for strength and high resistance. Fanning strip is closed with a thin film of Bakelite until drops are run.
2. Non-corrosive metal hood, Everdur studs and galvanized mounting bracket for long service life.
3. Phosphor-bronze spring clips to accommodate Cook Tru-Gap non-grounding lightning dischargers.

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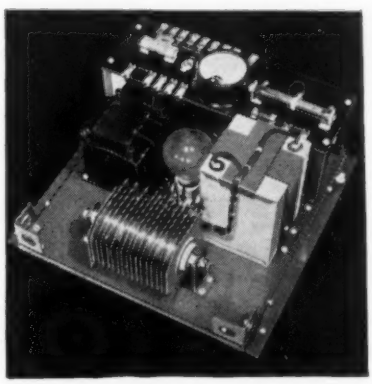
For more than ten years, leading independent telephone companies have found that Raytheon Rectifilters are the most economical and efficient way to supply steady DC power to PBX boards directly from an AC source.

With no moving parts, the Raytheon Rectifilter requires neither adjustment nor maintenance. It will outlast many sets of batteries, release wires carrying charging current from central office to subscribers' PBX boards for revenue producing service, and minimize power cost because of high efficiency in converting from AC to DC.

Dry disc rectifying units and other components are designed for long-life, trouble-free service. The Raytheon Rectifilter will end your telephone power problems. Just plug it in, close the door—and forget it!



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Fewer holes to dig; less material to be handled, installed and connected.

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Fewer poles mean less maintenance. High strength reduces possibility of breaks.

Write for Your Copy

of Manual No. 203! It is filled with interesting and factual information on how to build better rural lines at lower cost per mile.

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INDIANA STEEL & WIRE COMPANY

Muncie, Indiana

EVERY MORNING CHECK UP

By Ernest W. Fair

Here's a good "guide book for every day" that well can be posted where every telephone executive and employe can see it the first moment of coming on to the job.

I've left my blues outside **for today and am going to enjoy every moment of my day in the building.**

I'll say good morning **in a sprightly, happy voice so that every customer and all of my fellow workers will know that I really feel it is a "good morning."**

My clothing is all clean and neat **and adapted to my work in the building today.**

I'm going to learn a little today **about building the business that I didn't know yesterday; just one little thing or two that will help things operate more smoothly.**

I'm going to be more friendly **to our customers today than I was yesterday; try a little harder to show every one that we appreciate his business.**

I'm going to be safety conscious today **and avoid even the slightest opportunity for an accident to occur either to myself or someone else.**

I'll remember the routine of my job **from the moment I start on it today; not overlooking any small thing which may get the day off to a bad start for everyone concerned.**

I'm in the best of health **and ready for the day's job; I know it's best not to report on the job when I'm not feeling well.**

I had a good night's sleep last night **for I know I'm inefficient at my work when badly in need of sleep and that I run risks of injury and accidents through lax coordination when I have not had sufficient rest the night before.**

I've resolved today **to let no "irate person" get on my nerves, but to handle every such situation calmly and without losing my temper.**

I know the money I earn today **depends on my doing my job to the best of my ability for otherwise the firm cannot make a profit and cannot pay my salary.**

I'm going to do my smoking in spare time today **for though I enjoy it I know some people do not and I do not want to offend anyone today.**

I'm going to be courteous today **and express that courtesy from deep within for if I do it mechanically I may as well not practice it at all.**

I'm going to be conservative today **for I know any waste I may indulge in on the job will eat away the firm's profits from which my own income is derived.**

My work will be easier **if I practice the utmost courtesy and consideration of my fellow workers today and we'll all do our work much more efficiently.**

There's one little extra thing **I'm going to do somewhere in the day's business that will help things run smoother; I'll put forth the effort to discover what it can be and put it into practice.**

Fire Losses Jump 20.4% in July

Destruction by fire in the United States during July was estimated at $49,357,000, an increase of 20.4 per cent over losses of $40,998,000 incurred during July a year ago, it was announced Aug. 19 by W. E. Mallalieu, general manager of the National Board of Fire Underwriters. July's estimated losses were 2.9 per cent lower than losses of $50,840,000 during June.

July's losses brought the total destruction for the first seven months of 1947 to $418,633,000, an increase of 23.7 per cent over losses of $338,304,000 for the first seven months of 1946.

United States fire losses for the 12 months period ending July 31 were estimated at $641,816,000 which for the seventh time this year set a new high record for fire losses in a 12-month period. This is an increase of 21.9 per cent over losses of $526,188,000 for the 12 months' period ending July 31, 1946.

V V

To Sell Arkansas Exchange

Hugh Straughn, owner of the Southwest Arkansas Telephone Co. of Glen-

wood announced recently that the sale of four exchanges at Glenwood, Amity, Mount Ida and Norman to the Allied Telephone Co., Inc., will soon be completed. Mr. Straughn will remain with the new company as local manager.

V V

Mr. Templn Chps Wrds Dwn Lk Ths

The queerest job in the telephone business belongs to Russell W. Templin, who doesn't have to know a thing about telephones to do a good day's work. Mr. Templin is chief alphabet vivisectionist for the New York Telephone Co. and has spent the last 20 years chopping words to bits so they will fit economically into directories. He is the man to blame for such abbreviations as *lwyrs, clks, undtkrs, drs, dnts, brkrs, jobrs,* and so on.

Under Mr. Templin's supervision are the five alphabetical directories and the two classified books of New York with a total yearly circulation of 7,000,000. Mr. Templin not only chews ordinary words to pieces but unmercifully prunes subscribers' first names too. Last names can't be touched.

His goal is to keep listings to one line wherever possible. An extra line in 1,00,000 copies uses up a very sizable batch of paper.

V V

Discontinue "Big Ben" Group

Seven farmer-owned lines switched by the Paullina (Iowa) Telephone Co. and known as the "Big Ben" group, will be operated as the Southwest O'Brien County Telephone Co., according to Richard Hohbach, secretary of the company. The company is starting on a $10,000 improvement program which is scheduled for completion by Oct. 1.

Answers to Traffic Questions On Page 28

(1) Not to my knowledge.

(2) Ordinarily we do not ask for a line except for an emergency or urgent call. Therefore, this question should be referred to your manager as it is evident you are not adhering to the standard practice.

(3) Ordinarily, the toll center will not require this information except in completing a messenger call, collect call, call charged to a third station, etc.

(4) On a call held for "ag" when the calling party is ready to have his call tried and on a sequence call when the operator is ready to work on the call.

(5) Yes.

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Pulse Code Modulation

(Concluded from page 23)

the decoding process is functionally the reverse of the coding process and results in amplitude-modulated pulses. These are delivered to a low-pass filter which passes the voice frequencies and rejects the higher frequencies. Amplification provides the desired signal power for transmission to the subscriber.

Transmission Performance

The coded signals produced by the PCM transmitter can be transmitted by radio, coaxial cable, non-loaded cable pair, open-wire line or any other path suitable for transmitting 320,000 on-or-off pulses per second to the PCM receiver. The system has been operated successfully over a transmitting medium whose band width was limited to 420 kilocycles.

Thus, in order to transmit the intelligence of each nearly 4,000-cycle message circuit, this particular PCM system uses a 52.5-kilocycle band. This is appreciably more than the theoretical minimum for a single five-digit PCM channel. Since a 4,000-cycle band is the theoretical minimum for transmitting 8,000 on-or-off pulses per second, and since each channel uses 8,000 five-pulse characters per second, 20 kilocycles is the theoretical minimum band width for each PCM channel of this system. For comparison, a conventional single sideband carrier system uses a 4,000-cycle band for each message circuit.

The eight message circuits which each system provides give acceptable performance as indicated by the transmission-frequency and load performance characteristics of *Figs. 5 and 6*. As might be expected, the transmission stability of each of the eight message circuits is outstanding. *Fig. 7* is a typical recording of the level of a 1000-cycle test tone received from one of the eight message channels and shows that the over-all variation in transmission is less than 0.3 decibel. The 160-mile circuit referred to in *Fig. 7* was obtained by applying an eight-channel PCM system to a microwave radio relay system having three repeaters.

Conclusion

With the good transmission performance which this type of system affords, the individual channels can be used to carry the usual message services including signaling and dialing. Pulse code modulation appears to have exceptional possibilities from the standpoint of freedom from interference especially when applied to systems having many repeaters in tandem, but its full significance in connection with future radio and wire transmission may take some time to reveal.

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(The foregoing is a paper presented before the summer meeting of the American Institute of Electrical Engineers.)

V V

That's No Fare!

While driving an intercity bus for the Transport Co., Milwaukee, Wis., James Warnemuende spotted on the floor of the bus an unusual token that was used by the telephone company about the turn of the century. Two inches long and one inch wide, the token carried the message: "Milwaukee telephone exchange—Within the limits of this exchange—Good for one Conversation."

V V

Telephone Operator Resigns

MRS. LOLA CHAPMAN has resigned as a telephone operator after 28 years of service with the Grant City (Mo.) Telephone Co. VIRGINIA SOSHE succeeds her.

The Other Fellow

When the other fellow acts that way, he is ugly; when you do, it's nerves.

When the other fellow is set in his ways, he is obstinate; when you do, it's firmness.

When the other fellow treats someone especially well, he is toadying; when you do, it's tact.

When the other fellow takes his time, he is dead slow; when you do, you are deliberate.

When the other fellow picks flaws, he's cranky; when you do, you are discriminating.

When the other fellow says what he thinks, he is spiteful; when you do, you are frank.

—Glenn Frank

Deaf Author Helped To Success by Bell

Helen Keller, famous author who has been both blind and deaf since she was about a year and a half old, was aided in her early life by Alexander Graham Bell, inventor of the telephone, who was also a teacher and adviser of the deaf.

It was through Dr. Bell's suggestion that Helen's father wrote the Perkins Institution for the Blind in Boston and secured the services of the late Anne Sullivan Macey, who taught Helen to speak and was her constant companion for a half a century.

"Helen always called Dr. Bell her old friend," said Polly Thompson, also a constant companion of Miss Keller for many years.

"He often encouraged her and advised Mrs. Macey in her work in teaching Helen to speak. What endeared Dr. Bell most to Helen was the fact that his first wish while working on the telephone was to make the deaf hear."

Miss Keller, who can speak though she cannot hear a voice, said that this year has a "double significance" as the 100th anniversary of Bell's birth and the 60th anniversary of her meeting Mrs. Macey, "who led me by the hand into a world I never knew."

V V

Obituary

CHARLES S. MALTBY, assistant to the president of the Ohio Bell Telephone Co. until his retirement in September, 1939, died July 18 in Cleveland.

Known as an authority in the fields of taxation, industrial relations and public utilities economics, Mr. Maltby became attorney for the Ohio Bell when it was formed in 1921. In 1926 he was elected secretary and treasurer, and in March, 1939, he was promoted to the post of assistant to the president.

Mr. Maltby started his telephone career in the commercial department of the old Central Union Telephone Co. at Indianapolis, Ind., holding various positions in the commercial, traffic and sub-license departments of that company at Indianapolis, Chicago and Columbus.

He is survived by his widow, a daughter, a sister and a brother.

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First XY System Cut Over At Worthington, Pa.

The first XY dial telephone switchboard to be installed in the United States was cut over in Worthington, Pa., Aug. 7 by the Kittanning (Pa.) Telephone Co.

The XY switchboard—so called because it employs a number of XY switches which move in two right angle directions to find, select, or connect parties—was manufactured by the Stromberg-Carlson Co., Rochester, N. Y.

K. Benjamin Schotte, Jr., general manager of the Kittanning company, which owns the Worthington exchange, told Senator Edward R. Martin in Washington, in the first official call completed over the new system, that the new XY dial system is the first of several which his company will install in surrounding communities.

Smiles of satisfaction are registered by (from left) LLOYD L. SPENCER, Stromberg-Carlson vice president and general sales manager; K. B. SCHOTTE, general manager of the Kittanning (Pa.) Telephone Co., and DR. RAY H. MANSON, Stromberg-Carlson president, at Worthington cutover.

DR. RAY H. MANSON (left), Stromberg-Carlson president, takes up conversation with SEN. EDWARD R. MARTIN, former Pennsylvania governor, at his home in Washington, D. C., in first official call put through from new Worthington, Pa., XY dial exchange. Pensive listener at right is K. B. SCHOTTE, general manager of the Kittanning (Pa.) Telephone Co., who initiated the call.

Dr. Ray H. Manson, Stromberg-Carlson president, who was present for the cutover, also spoke briefly to the former Pennsylvania governor.

In the first seven hours following the cutover of the new XY system the 250-odd subscribers in the Worthington exchange made 3,741 calls and after that calls came in at the rate of 400 an hour. With the installation of the new equipment 50 new subscribers were given service. Provision also has been made in the new switchboard to take care of further growth of the Worthington exchange.

Before placing the call to Senator Martin, Mr. Schotte was host at a dinner to a group of visiting telephone men, who came to witness the cutover.

Those attending from the Kittanning Telephone Co., in addition to Mr. Schotte, were Harry Montgomery, J. W. Rohrer, James Ellermeyer, Charles Moesta, Willis Heilman (all directors of the company), P. R. Parsons, A. D. Doverspike, H. F. Moore and F. D. Young.

In addition to Dr. Manson, the following representatives of Stromberg-Carlson attended the cutover: Vice Presidents Lee McCanne, L. L. Spencer and Frederic C. Young; Dr. H. R. Reed, chief telephone engineer; A. F. Gibson, assistant general sales manager; T. C. Thompson, telephone sales manager; E. S. Browning, chief installer; David Soloman; Henry Bascom; John Voss; William O'Toole; N. W. Baldwin; Emmet Shanks; James Confeld; Charles Nichols; George Roby; Frank Edgarton; R. C. Lake; E. Ferguson, and B. S. Twining.

Representatives of other operating telephone companies included John Horne, W. W. Shoop, C. C. McAllister, R. F. Doutt, E. F. Harder, W. J. Geiss, G. S. Mason, W. L. Shafer, C. F. Hefft, Earl Plaisted, A. N. Seward, C. E. Jones and Harry Strosneider.

V V

Automatic Group Announces Organization Changes

The election of H. F. Lello as vice president and general manager of Automatic Electric Co., effective Sept. 1, has been announced by C. S. Cadwell, president of the company. Mr. Lello was formerly president of Automatic Electric Sales Corp. and International Automatic Electric Corp., the domestic and export sales companies of the Automatic Electric group.

In his new capacity Mr. Lello assumes general administrative supervision over all operations of Automatic Electric Co., including development, engineering, manufacturing, service and sales and commercial activities. To

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Leich Sales Corporation
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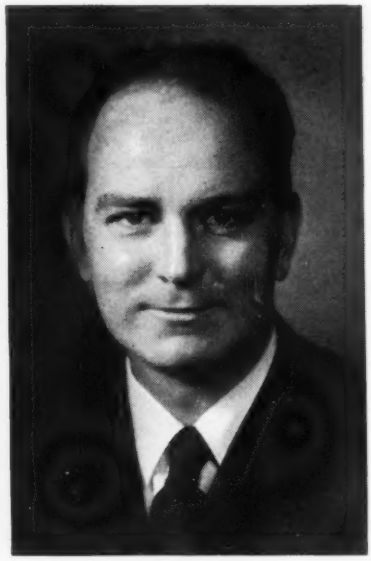

L. H. WARNER

G. K. BEARE

his new duties he brings the advantages of a background rich in experience in various phases of the company's business, including not only its internal activities and operations, but also those dealing with domestic and export sales and customer relations in those fields.

Mr. Lello has been associated with various companies of the Automatic Electric group for 24 years. Beginning as a shop clerk in 1923, he quickly showed unusual aptitude in acquiring knowledge of the business, and since that time has steadily advanced to positions of increasing responsibility. Throughout his career, he has consistently demonstrated a capacity for sound judgment, a willingness to assume responsibility, and outstanding ability for handling a steady succession of difficult and important assignments.

After several years in cost accounting, pricing, and related activities, Mr. Lello entered the sales organization in 1939 and quickly became familiar with the company's selling operations. During the war he was recalled to the manufacturing organization to assume responsibility as staff co-ordinator in charge of production scheduling during the critical period when the company's efforts were devoted mainly to war production. In this capacity he became thoroughly familiar with the difficult problems involved in the engineering, production and scheduling of the company's equipment output. Following the war he returned to the sales organization, becoming sales manager in 1944, and two years later, vice president and general manager of both domestic and export sales companies. He was elected president of both these companies early this year.

Announcement has also been made that L. H. Warner, formerly commercial manager for Automatic Electric Co., has been elected president of Automatic Electric Sales Corp. and of International Automatic Electric Corp., succeeding Mr. Lello in both of these offices. For several years Mr. Warner has been active in sales and promotional activities for the Automatic Electric group, and in his new position he now assumes complete direction of both sales organizations and the operations of their branch offices and distributing subsidiaries.

Mr. Warner joined the Automatic Electric organization in 1937 immediately after graduating from the Harvard Graduate School of Business Administration, and before entering Harvard had been employed for several years in the Long Lines Department of the American Telephone & Telegraph Co. His first work with Automatic Electric Co. was concerned with special assignments for the president, and he shortly afterwards became assistant to C. S. Cadwell, who was then general sales manager. In August, 1938, he was selected to go to Brazil as managing director of the company's distributing affiliate in that country. Returning to the United States in 1942, he was elected vice president of both sales companies and placed in charge of the eastern district with headquarters in New York City.

In November, 1946, Mr. Warner returned to Chicago to become commercial manager for Automatic Electric Co. in which capacity he was assigned to the supervision of all matters having a commercial aspect and relating to sales promotion, advertising, engineering and service, and to the handling of trade agreements, negotiations, and contracts relating to the company's world-wide operations.

Coincident with the above changes, G. K. Beare, formerly commercial manager of the affiliates division of the Automatic Electric group, has been appointed general commercial manager of Automatic Electric Co., and now assumes certain of the responsibilities formerly carried by Mr. Warner in that position, including supervision of advertising, trade agreements, and other matters having a commercial aspect. In addition, as general manager of the company's affiliates outside the United States, he has responsibility for the administrative management of the manufacturing and sales subsidiaries of Automatic Electric Co. and Interna-

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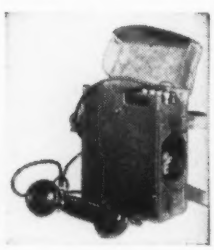

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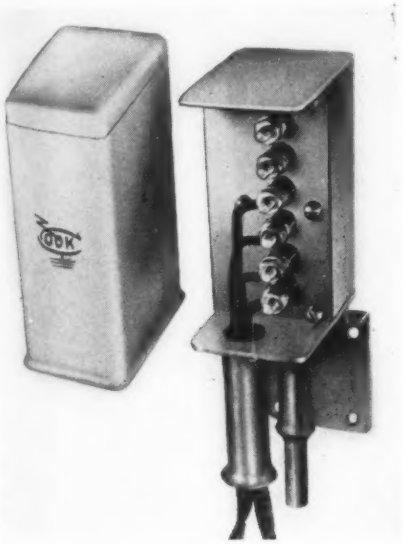
V V

Cook Electric Announces New Three Pair XB Terminal

Anticipating a growing demand for a better and more economical means of subscriber distribution out of rural cable, Cook Electric Co., Chicago, has developed a new three-pair XB terminal. This development was initiated by the Intra-State Telephone Co., Galesburg, Ill.



The use of these terminals on rural cable routes makes it possible to reduce the length of subscriber drops and eliminates bracket lines.

The new terminal is especially designed to reduce to a minimum line resistance and current leakage on longer rural cable routes, especially where automatic operation is in use, the company states. Features of the new terminal include a heavy, close-fitting welded zinc cover, non-corrosive Monel face plate on which are mounted the highly insulated cable studs; use of the flanged tube as an entrance for drop wires. This tube can be completely sealed after the drop wires are installed.

The new Cook terminal measures 7½ ins. high, 3¾ ins. deep and 2½ ins. wide. It is furnished with or without cable stub, to user's specification.

V V

C & D Names C. F. Gross Philadelphia Manager

C. F. Gross has been appointed Philadelphia division manager for the C & D Battery Co. The C & D Philadelphia division organization of three salesmen and a service engineer handle the sale of the complete C & D industrial battery line for electrical industrial trucks, locomotive, diesel, tele-

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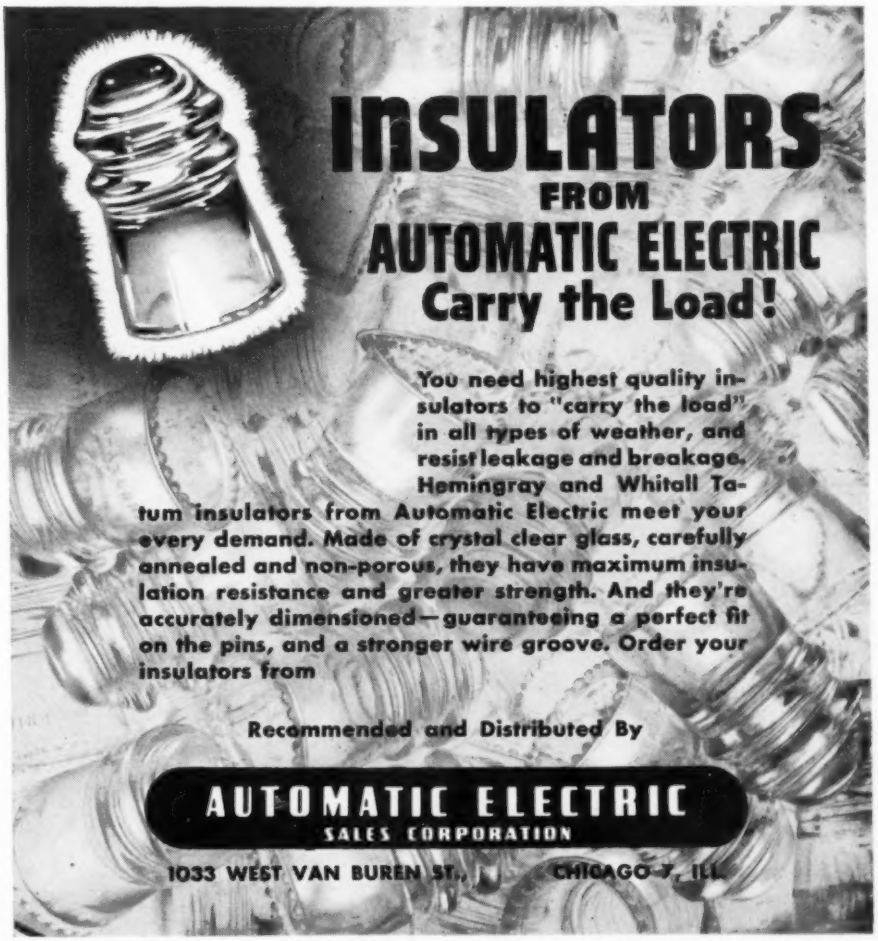
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Mr. Gross was educated at the Drexel Institute of Technology, Philadelphia, and is widely known in industrial circles for his knowledge of batteries. He is secretary-treasurer of the Material Handling Society of Philadelphia, the membership of which is composed of material handling specialists and engineers, together with representatives of concerns manufacturing electric industrial trucks, batteries and accessories.

He was formerly with the Philco Storage Battery Corp., which was recently purchased by Gould Storage Battery Co. of Depew, N. Y., a subsidiary of National Battery Co.

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